

UPPER COSUMNES RIVER WATERSHED RESOURCES INVENTORY

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Prepared by
USDA Natural Resources Conservation Service

In cooperation with
Sloughhouse Resource Conservation District
And
The Cosumnes River Task Force

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CHAPTER 1: INTRODUCTION

In November, 1999, the Sloughhouse Resource Conservation District, a local special district, and the Cosumnes River Task Force, a local watershed group, interested in the Cosumnes River, requested assistance from the USDA, Natural Resources Conservation Service in developing a resources inventory as a component of their overall Coordinated Resource Management Planning Process. The Resources Inventory covers the 936 square mile Cosumnes River Watershed with emphasis on the middle watershed. The focus is on soils, sediment, geology-landslides, hydrology and water use, water rights, water quality, land-use (including rural and urban areas, agriculture, rangeland and forest and brush land), biology and wildlife habitat, fisheries, and cultural resources found in the watershed.

Early on, it was determined that the project would be divided into three phases: Resources Inventory Phase I, to be conducted by the Natural Resources Conservation Service; Resources Inventory Phase II with the majority of the work contracted to Jones & Stokes Inc.; and Phase III the development of the Watershed Management Plan.

PHASE I

The goal of the first phase of the Resources Inventory was to compile available information and determine what information gaps needed to be addressed in Phase II. Phase I of the Resources Inventory was prepared by a team of specialists from the Natural Resources Conservation Service in cooperation with the Sloughhouse Resource Conservation District and the community based Cosumnes River Task Force.

EXPECTATIONS FOR PHASE II

Compile Recent and Historic Aerial Photographs

A complete set of recent and historic aerial photographs of the watershed will be compiled. Photographs from 1993 are available for the entire watershed and can be used to define recent conditions. Photographs from approximately 1971 to 1975 also appear to be available for the entire watershed and could be compared against the 1993 images.

Erosion Features Map

An active map of erosion features in the Cosumnes River watershed will be prepared. The results of this work will be an ArcView shape file to be used in Phase III to determine where erosion control measures should be implemented. The rate of erosion occurring at each erosion feature will not be quantified. The focus of this mapping will be to identify apparent sediment-producing “hot spots” in the watershed. Only discrete areas of obvious sheet, rill, gully, and

mass movement erosion that appear to be significant producers of sediment will be mapped. The type and probable cause of erosion will be identified and associated with the feature as an attribute.

Land Cover / Land Use Map

An existing land cover/land use map of the watershed will be prepared. The result of this work will be a GIS data layer to support other components of Phase II and studies. Also, mapping will include historic land cover/land use (1970s) in the watershed to provide a basis for identifying the locations and types of changes that have recently occurred. Natural vegetation cover types will be mapped according to Holland's (1986) general categories for non-cultivated and urban areas. Crop types will be categorized into such classes as row crop, irrigated pasture, vineyard, and orchard. Urban land uses will be categorized into three levels of density: low density residential, suburban, and urban. The minimum mapping unit will be 10 acres.

Evaluation of Unsurfaced Roads

Prepare and evaluate maps of unsurfaced roads. The result of this work will be a GIS data layer that, when evaluated in context with other GIS data (such as slope gradient), will provide a basis for identifying the relative potential for erosion of specific roads. Such information may be used in Phase III to identify where road decommissioning and road drainage improvements should be implemented. This is necessary because unsurfaced roads generate a disproportionate amount of sediment compared to other types of land cover. Locations of stream crossings will be specifically noted.

Predictive Sediment Yield Analysis

A GIS-based sediment yield analysis of the watershed will be developed. One results of the analysis will predict the average annual sediment yield by sub-basins within the watershed. Land cover and land types associated with the sediment yield and/or soil loss will be identified.

Channel Conditions Assessment

A reconnaissance-level assessment of channel conditions between the Eldorado National Forest and Highway 16 will be conducted. This assessment will incorporate the methods used on the National Forest and will result in a complete coverage of the entire watershed. Results will include a map showing the distribution of channel types in the watershed, along with tables showing channel attributes for all sample locations. This information will be used to identify channel reaches that exhibit less than optimal conditions regarding erosion, sediment transport and riparian/aquatic habitat. Problem areas of habitat or channel function will be linked to adjacent contributing land uses, erosion and sediment yield, and hydrologic characteristic data from University California, Davis.

Sediment Load

Total sediment load at the Michigan Bar gage will be measured during several individual storm events in the 2001–2002 and 2002–2003 water season to develop sediment load rating curves from this portion of the watershed. These curves will be used to verify sediment yield estimates developed from ongoing and proposed upper watershed studies, as well as for ongoing and proposed studies of sedimentation dynamics in the middle and lower reach of the river. The newly developed sediment transport-rating curve will be compared with historical measurements completed by the U.S. Geological Survey at the same location to assess any changes in the sediment load characteristics. Field measurements of sediment transport near Michigan Bar will also be useful for defining the amount of gravel recruitment potentially affecting the critical spawning reach downstream from the gage, as well as the quantities of suspended sediment that may affect spawning gravel quality.

Reconstruct Channel Planform and Profile Characteristics

The reach bounded by Highway 16 and Highway 99 has been identified as critical habitat for salmonid spawning and rearing. Several human-induced land use changes have occurred in this reach, including levee construction, low-water diversion construction and operation, and aggregate extraction. All these factors have affected the present morphological characteristics of the reach, as well as the locations of spawning gravels within this reach. The historical analysis will provide snapshots of channel morphological characteristics, as well as natural (i.e. floods) and human-induced activities (i.e. levee construction) that resulted in observed channel changes. The snapshots of historical channel planform and profile allow an assessment of potential habitat restoration and flood mitigation targets for the reach.

A timeline of historical hydrologic events (significant floods, drought periods, etc.) will be developed. In addition, a timeline of levee construction, aggregate extraction, water diversion dam construction and operation, and other human-induced physical changes to the river system. These timelines will be cross-referenced to develop cause-and-effect relationships between natural and human-induced changes to the system.

Assess Watershed Conditions and Identify Resource Problems

Information collected will be assessed with a focus on identifying and confirming resource problems in the watershed. Identified, to the extent practicable, will be the cause-and-effect relationships relative to identified problems. A series of four facilitated workshops will be held for representatives to review the available data and develop technical conclusions. The focus of these meetings will be to develop cause-and-effect relationship models and to map these relationships and specific resource problems throughout the watershed. Public meetings will be conducted for stakeholders to assess and comment on preliminary and final conclusions.

A watershed conditions assessment will be created. This document may include but is not limited to descriptions of conditions in the following categories: hydrology and hydraulics, fluvial geomorphology, aquatic ecology, riparian and terrestrial ecology, land use, water quality, and water use. Graphic conceptual models of cause and effect relationships and text narratives supporting these models will be developed. Maps identifying problems and causes throughout

the watershed will be prepared. The report will be the basis for the proposed future watershed planning process and will be used to support the development and prioritization of watershed and site-specific improvements.

PHASE III WATERSHED MANAGEMENT PLAN

Upon completion of Phase II of the Resources Inventory will be the commencement of Phase III, The Watershed Management Plan. The Watershed Management Plan will be used as a guide to resource planning, restoration and enhancement efforts and water quality improvements based on information gathered and developed in Phase I and II. The guide will be a tool by which stakeholders and Cosumnes River Task Force members can use to build support for an ecosystem approach to land use, resource, habitat and water quality and quantity planning efforts. It will be up to the each citizen, agency and district to move the process to the next phase: Implementation.

CHAPTER 2: KEY GROUPS OR AGENCIES

WATERSHED WIDE

Cosumnes River Task Force (CRTF)

On January 2, 1997, the Cosumnes River Watershed experienced the most extensive flood events in recorded history. Water flow exceeded the estimates of a 100-year storm event. Twenty-four levees broke resulting in the inundation of eighty homes and 24,000 acres of agricultural land including orchards, vineyards, ranches and farms. Estimates of financial losses by the Agricultural Commissioner in Sacramento County alone reached \$10.5 million to row, field and croplands, \$2 million to orchards and vineyards and \$.5 million to pasture and rangeland.

One positive result of the 1997 flood was the creation of the Cosumnes River Task Force. The Cosumnes River Task Force was formed in 1998, by suggestion of the governor, as a joint effort between the Sloughhouse Resource Conservation District and Sacramento County Department of Water Resources. The mission of the Cosumnes River Task Force is to develop a long term strategy that will encourage restoration of watershed health and improve flood management.

Cosumnes River Research Group

The University of California, Davis, in association with the seven agency and nonprofit partners of the Cosumnes River Preserve, has established a coordinated university/agency/foundation partnership dedicated to: advancing watershed science to support more effective and sustainable watershed restoration practices, and addressing the information needs of adaptive management in the North Delta and the Cosumnes and Mokelumne River watersheds.

LOWER WATERSHED

The Sloughhouse Resource Conservation District (SHRCD)

The Sloughhouse Resource Conservation District is committed to assisting landowners, within the Cosumnes River Watershed, with erosion and flood control problems, water quality issues, and watershed outreach and conservation education with respect for private property rights.

The Florin Resource Conservation District (FRCD)

The Florin Resource Conservation District is committed to helping our community care for its natural resources. Water quality, stream bank restoration, weed management, and conservation education and outreach are priority issues we pledge to address.

The Lower Cosumnes Resource Conservation District (LCRCD)

The Lower Cosumnes Resource Conservation District understands the importance of education to the conservation effort. We are committed to enhancing community stewardship for its natural resources by providing outreach programs that will address flood management, wildlife habitat enhancement, and weed management.

The Nature Conservancy (TNC)

The Cosumnes River Preserve is dedicated to safeguarding and restoring the finest remaining example of a California valley oak riparian (streamside) ecosystem and its surrounding habitats. Restoring and creating freshwater wetlands to increase the Pacific Flyway's populations of migratory waterfowl. Demonstrating the compatibility of human uses -- particularly agriculture, recreation, and education -- with the natural environment.

UPPER WATERSHED

Amador Resource Conservation District (ARCD)

The Amador Resource Conservation District is committed to: (1) Generating wise use of basic resources in areas such as forest health, water quality, changing land use and air quality; (2) Identifying and supporting innovative approaches to improving the regions resource based economy in areas such as forestry, agriculture, tourism and energy production; (3) Preserving our regional quality of life and foothill culture.

El Dorado Resource Conservation District

The District works in four areas of strategic focus: Organization, Fire, Watersheds, and Education. For each strategic area, the District has developed an overall goal: (1) Organization: Develop the District's capacity to plan and deliver conservation programs; (2) Fire: Significantly reduce the risk to life, property, and watershed health from wildfire through support of fuel management projects and public information programs; (3) Watershed: Coordinate and facilitate the development of a watershed scale resource management and restoration program for the South Fork of the American River, and for the Cosumnes River. Work with all interested stakeholders and agencies to address watershed scale problems and opportunities; (4) Education: Help to fill the training and resource management information needs of homeowners, landowners, and resource users.

The American River Conservancy (ARC)

The ARC is a highly active organization in the upper watershed (Highway 49 to the headwaters). The American River Conservancy has acquired conservation easements on approximately 1,200 acres, protecting riparian habitat along the mainstem Cosumnes River. In addition, the

Conservancy has recently completed a two-year research project, Environmental Assessment and Strategic Plan to identify conservation opportunities within the upper Cosumnes River Basin that also serve to complement and advance the social and economic interests of the communities.

The Eldorado National Forest Service

In January 2001, the U.S. Forest Service issued a Record of Decision and adopted the Sierra Nevada Forest Plan Amendment. The Eldorado National Forest is working under new direction provided for by this plan. According to the Sierra Nevada Forest Plan Amendment, Final EIS Record of Decision, January 2001, the purposes of the Regional direction is to: (1) Protect, increase, and perpetuate old forest ecosystems and provide for the viability of native plant and animal species associated with old forest ecosystems; (2) Protect and restore aquatic, riparian, and meadow ecosystems and provide for the viability of native plant and animal species associated with these ecosystems; (3) Manage fire and fuels in a consistent manner across the national forests, coordinate management strategies with other ownerships, integrate fire and fuels management objectives with other natural resource management objectives, address the role of wildland fire, and set priorities for fire and fuels management actions; (4) Reduce and where possible, reverse the spread of noxious weeds; (5) Maintain and enhance hardwood forest ecosystems in the lower west side of the Sierra Nevada. (Sierra Nevada Forest Plan Amendment, Final EIS Record of Decision, Jan. 2001).

The Eldorado National Forest Service is also in the process of conducting a sediment survey and revising their roads assessment map for the Cosumnes River Watershed.

Amador Land Trust (ALT)

The Amador Land Trust's mission is to protect and preserve local agricultural, historic, and scenic sites and natural habitats for the benefit of generations to come. They focus on Amador, Calaveras, El Dorado Counties with some focus areas around the towns of Volcano and Sheep Ranch.

Since 1991, the Amador Land Trust, through donation, has acquired 2,247 acres of conservation easements and fee title acquisitions. The project sites each has different land use restrictions and allowances regarding development, logging, grazing, agriculture, etc.

Friends of the River

The Friends of the River included in their 2001 inventory, 24 miles of the North Fork of the Cosumnes and 22 miles of the Middle Fork of the Cosumnes as potential wild and scenic rivers in California eligible for designation under the federal Wild and Scenic Rivers Act.

REFERENCES

Sierra Nevada Forest Plan Amendment, Final EIS Record of Decision, Jan. 2001.

CHAPTER 3: GENERAL DESCRIPTION

The Cosumnes River, at a length of just 80 miles, is neither the longest nor largest river system in California. However, it retains a special significance as the last untamed, free flowing river system west of the Sierra Nevada Mountains. The river has a natural flow regime drying up in drought years and flooding in wet years. Flora and fauna located along and in the river and on the associated floodplains have evolved to not only survive, but also actually depend on these fluctuations (American River Conservancy, 2000).

The U.S. Army Corps of Engineers conducted a Reconnaissance Study of the watershed in 1999 to assess water and related land resource problems. Specific problems identified included levee failure and flooding; erosion and channel incision; excessive sediment transport and deposition degradation of the riverbed; constriction of the floodplain; isolation of the floodplain from the river channel; reduction of flows in summer and fall; and loss of aquatic and riparian habitat. Additionally, the Environmental Protection Agency has identified the lower watershed as having a “serious water quality problem” and the California Unified Watershed Assessment has listed it as having the “highest restoration priority” (Environmental Protection Agency, 1998).

In a healthy river system, the amount of sediment entering the river should equal the amount of sediment carried in the water flow until it flows into another body of water or deposited as alluvium. A healthy river channel should then exhibit typical bar-pool morphology. And indeed, aerial photographs from as early as 1937 demonstrate this bar-pool morphology existed along the Cosumnes. In particular, extensive bars are noted in the channel between Highway 16 and Wilton Road.

More recently, however, the river channels have degraded significantly as a direct result of levee construction and decreased water flow and velocity. Decreased water flow, exacerbated by increased agricultural usage lowering the ground water table by approximately 60 feet (U.S. Army Corps of Engineers, 1999; U.S. Army Corps of Engineers 1991; U.S. Army Corps of Engineers, The Nature Conservancy, East Bay Municipal Utilities District & UC Davis, 2000 & Philip Williams & Associates LTD., 1997), has lead to increased sedimentation. Increased sedimentation is not only degrading the water quality, but is also threatening the stability of bridges, bank vegetation, and levees constructed to protect adjacent properties. Increased sediment has altered stream morphology contributing to the loss of stream vegetation and salmon spawning gravel (U.S. Army Corps of Engineers, 1999).

The Cosumnes River historically has supported large Chinook salmon runs. However, decreased fall flows associated with lowered ground water tables are thought to be, at least, partly responsible for recent declines in fish populations (Fleckhenstein, Suzuki & Fogg, 1999). Reduced flows have allowed sediment to cement gravel beds making them unsuitable as spawning habitat (U.S. Army Corps of Engineers, The Nature Conservancy, East Bay Municipal Utilities District & UC Davis, 2000). Other watershed animal life of special concern include the Delta smelt, splittail, vernal pool fairy shrimp, vernal pool tadpole, the giant garter snake, Swainson’s hawk, bank swallow, western spadefoot, tri-colored blackbird, and the valley

elderberry longhorn beetle (CA Department of Fish and Game, 2000).

Increasing concerns by agencies and individuals over the quality of California watersheds has launched statewide efforts to assess overall watershed health. In an effort to provide for a coordinated assessment and restoration effort within the Lower Mokelumne-Lower Cosumnes watershed and at the recommendation of the Governor's Flood Emergency Action Team, Sacramento County and the Sloughhouse Resource Conservation District formed the Cosumnes River Task Force. The Cosumnes River Task Force is developing a coordinated resource management plan and enlightening agencies and individuals of the problems within the watershed. The Cosumnes River Task Force will next begin the implementation of restoration projects suggested by the U.S. Army Corps of Engineers Reconnaissance Study with resources identified through the ongoing Natural Resources Conservation Service Resources Inventory.

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FIGURE 1 LOCATION MAP

FIGURE 2 MAP OF THE COSUMNES RIVER WATERSHED

CHAPTER 4: LAND-USE

Alterations to the Cosumnes River watershed include timber harvest, mining, urban and residential development, and grazing and agricultural development. Land in the upper watershed is predominately owned by the Eldorado National Forest. The Eldorado National Forest occupies 200 square miles in the upper watershed, approximately 21 percent of the entire watershed. Current mining activities include: clay mining (pits) along the Lone formation, five sand and gravel operations, two coal operations, two stone mines and a shale mine within the watershed (Phillip Williams & Associates, LTD., 1997).

Recreation use includes picnicking, swimming, hiking, fishing, camping, rock climbing, and river running (there are a variety of boating runs for paddlers of all skill levels, although the length of the boating season is curtailed by the relative low flow in the summer). Overall, the recreation potential is outstanding in view of the proximity of the Sacramento Metropolitan Area, although the limited number of river access points presently discourages use (National Park Service, 2001).

Important/Interim Farmland Maps are available for the entire watershed at a scale of 1:100,000 (created by the Department of Conservation). Mapped features include: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban & Build-up, Other Land and Water.

TABLE 1: AMADOR COUNTY- (STATISTICS INCLUDE THE ENTIRE COUNTY, NOT JUST THE COSUMNES RIVER WATERSHED)

AMADOR COUNTY	2000	1999
Fruit and Nut Crops	\$12,747,210	\$11,436,066
Livestock & Poultry	\$6,731,165	\$5,054,869
Apiary Products	\$30,915	\$31,050
Field Crops	\$2,820,947	\$2,770,395
Nursery Stock	\$160,000	\$150,000
Christmas Trees	\$56,250	\$59,250
Timber and Related Products	\$9,982,039	\$8,448,000
Minor and Misc. Crops	\$145,200	\$138,000
Total Values – All Categories	\$32,673,726	\$28,087,630

Amador County Department of Agriculture, 2000 Report of Agriculture

TOTAL LAND AREA	363,500
Williamson Act Land	93,000
El Dorado National Forest	78,079

BLM Land	9,191
Timber Preserve Land	27,485
Pasture and Range land	167,000
Land in Farms	218,000
Farms in County	376
Amador County Department of Agriculture, 2000 Report of Agriculture	

Total gross value for agricultural commodities produced in 2000 were \$32,673,726. This represents an increase of 14.03 percent over the prior year's gross value at \$28,087,630. Fruit and Nut Crops increased 10.38 percent, Livestock increase 24.90 percent and timber increased 15.37 percent and wine grape production increased by 11.14 percent, Amador County's leading commodity (Boitano, Michael, 2001).

TABLE 2: EL DORADO COUNTY- (STATISTICS INCLUDE THE ENTIRE COUNTY, NOT JUST THE COSUMNES RIVER WATERSHED)

EL DORADO COUNTY	1999	1998
Fruit & Nut Crops	\$8,311,600	\$8,659,000
Livestock	\$3,225,300	\$2,656,400
Apiary Products	\$265,500	\$274,500
Hay and Pasture	\$2,680,300	\$2,684,300
Nursery Products	\$2,646,700	\$2,480,400
Christmas Trees	\$2,208,300	\$1,633,800
Timber Harvested & By-Products	\$31,785,200	\$27,698,800
Minor and Misc. Crops	\$339,700	\$277,303
Total Values - All Categories	\$51,462,600	\$46,364,500

Snodgrass, Bill. 2001. El Dorado County Weights and Measures.

ACRES	1999 HARVESTED ACRES	1998 HARVESTED ACRES
Fruit & Nut Crops	2,809	2,772
Livestock	not available	not available
Apiary Products	not available	not available
Hay and Pasture	246,730	246,785
Nursery Products	47	47
Christmas Trees	79,900	67,400
Timber Harvested & By-Products	not available	not available
Minor and Misc. Crops	not available	not available

Snodgrass, Bill. 2001. El Dorado County Weights and Measures.

1999 showed an increase by 11 percent over 1998 figures. Wine grapes for the first time were the leading crop with 23 percent increase in value. Christmas tree production was up by 35, cattle by 22 percent, pears up by 30 percent, and timber was up by 15 percent. However, the apple crops have been in significant decline over the past two years. In 1998 disease and wet conditions caused by El Nino caused a 30 decline by in 1999 hail caused a 45 percent decline (Snodgrass, 2001).

TABLE 3: SACRAMENTO COUNTY- (STATISTICS INCLUDE THE ENTIRE COUNTY, NOT JUST THE COSUMNES RIVER WATERSHED)

SACRAMENTO COUNTY	1999	1998
Fruit & Nut Crops	\$124,217,000	\$110,297,000
Livestock & Poultry	\$73,010,000	\$78,955,000
Apiary Products	\$115,000	\$159,000
Field Crops	\$42,356,000	\$37,135,000
Nursery Products	\$17,113,000	\$17,933,000
Christmas Trees	not available	not available
Timber Harvested & By-Products	not available	not available
Minor and Misc. Crops	\$37,048,000	\$30,929,000
Total Values - All Categories	\$293,859,000	\$275,408,000

Sacramento County 1999 Crop & Livestock Report

ACRES	1999 HARVESTED ACRES	1998 HARVESTED ACRES
Fruit & Nut Crops	29,897	20,184
Livestock & Poultry	not available	not available
Apiary Products	not available	not available
Field Crops	181,229	189,054
Nursery Products	678	533
Christmas Trees	not available	not available
Timber Harvested & By-Products	not available	not available
Minor and Misc. Crops	21,169	18,806

Sacramento County 1999 Crop & Livestock Report

A 1997 study by American Farmland Trust, "Farming on the Edge," ranked the Sacramento and San Joaquin valleys as the leading region in the nation in terms of development pressure on agricultural land. According to a new set of maps and conversion statistics released by the Department of Conservation, more than 1,300 acres of Sacramento County farmland were converted to urban use from 1996-98. Another 1,065 acres were committed to nonagricultural use in the future.

More than 7,000 acres of the two best categories of farmland are no longer in cultivation. The majority of this land has been downgraded to a lesser farmland classification because it has been idle for at least six years. This farmland could be returned to cultivation. Losses of irrigated farmland were somewhat offset by the conversion of 3,927 acres of grazing land to irrigated land, primarily for vineyards, on poorer quality soils in the southeast section of the county (Department of Conservation, 2000).

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Snodgrass, Bill. 2001. Agricultural Department of Weights and Measures, 1999 El Dorado County Crop Report. <<http://www.atasteofeldorado.com/cropreport.html>>.

CHAPTER 5: HYDROLOGY

The Cosumnes River Watershed ranges in elevation from sea level to 7,600 feet at the headwaters. The topography from the confluence of the Mokelumne River to the Highway 49 crossing over the Cosumnes River is gently sloping with a topographic change of only ~800 feet. Above highway 49 is moderately to steep sloped with a 6,800 feet elevation change.

CLIMATE

The Cosumnes River Watershed climate is Mediterranean, with hot, dry summers and cool, wet winters. The majority of the precipitation falls between November and April. Mean annual rainfall for the Cosumnes River Basin is 40", Deer Creek basin averages 27" and Laguna averages 21".

Snow cover below 5,000 feet elevation is generally intermittent and may accumulate and melt several times over the winter season. At higher, 5,000-7,500 feet elevations, snow generally accumulates between November and April. Because the Cosumnes is a low elevation watershed, snowmelt does not contribute significantly to seasonal runoff or flooding, only about 16percent of the Cosumnes River Basin is above 5,000 feet (U.S. Army Corps of Engineers, 1991).

In the lower watershed humidity is high during the moist winter months but is low during the hot dry summer. Due to the low humidity, evapotranspiration is high during the growing season and soil moisture reserves decline quickly.

Fog is prevalent in the lower watershed during the winter months. The fog often dissipates early in the day especially along the rivers and sloughs.

COSUMNES RIVER

The Cosumnes River has being virtually unaffected by dams; no large dams have been constructed on the river or any of its tributaries. As part of the Central Valley Project, the Bureau of Reclamation operates two small dams: Sly Parks Dam, a diversion off of Camp Creek and a diversion tunnel, the Sly Park-Camino Conduit (Philip Williams & Associates, LTD., 1997). Compared to other Sierran Rivers, the "...magnitude of change in hydrologic patterns in the watershed is small when compared to other Sierran Rivers" (Philip Williams & Associates, LTD., 1997).

Winter precipitation usually falls above 5,000 feet; approximately 16percent of the watershed is above 5,000 feet in elevation. Due to this relatively low elevation of the headwaters, this watershed in the Sierra Nevada Mountains receives limited flow from snowmelt. Annual rainfall averages from 15-60 inches, depending on the elevation, with an average of 33 inches. The average annual inflow to the lower reaches of the Cosumnes River near McConnell is

approximately 400,000 acre-feet (Philip Williams & Associates, LTD., 1997).

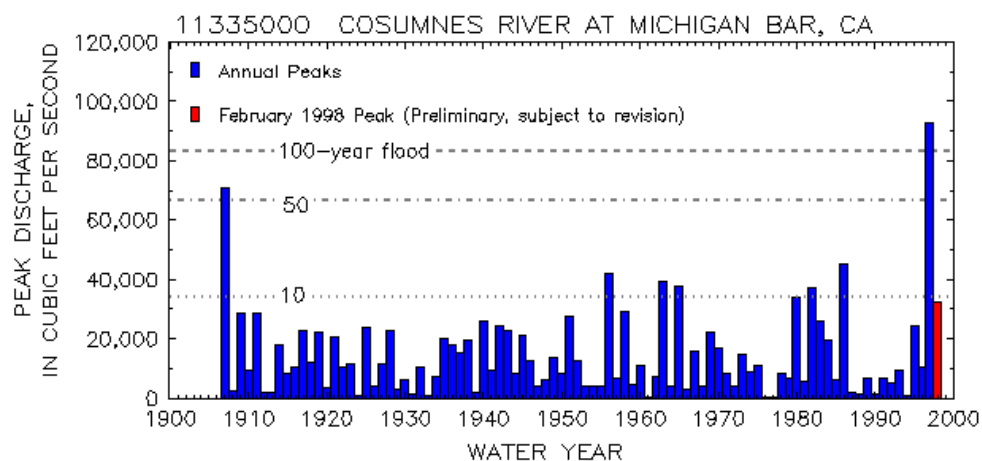
GROUNDWATER PUMPING

Large changes in groundwater elevations occurred after the 1940s when an increase in urban and agricultural development occurred in the area. Even in recent years the decline has been dramatic; from 1984-1995 the groundwater table in the lower watershed dropped 20-30 feet (Philip Williams & Associates, LTD., 1997).

FLOOD ACTIVITY

Flooding is a persistent problem for both commercial and residential owners. Primary problems caused by flooding include levee breaks, land erosion, silt deposition, crop damage, and road damage (Philip Williams & Associates, LTD., 1997). On January 2, 1997 the Cosumnes River Watershed experienced the most extensive flood event in recorded history. Water flows exceeded the estimates of a 100-year storm event. Levees constructed in the early 1900s primarily for agricultural purposes failed to provide adequate protection for either agricultural property or new community development. Twenty-four levees broke resulting in the inundation of eighty homes and 24,000 acres of agricultural land including orchards, vineyards, ranches and farms. Estimates of financial losses by the Agricultural Commissioner in Sacramento County alone reached \$10.5 million to row, field and croplands, \$2 million to orchards and vineyards and \$.5 million to pasture and rangeland.

TABLE 4: PEAK DISCHARGE COSUMNES RIVER AT MICHIGAN BAR



U.S. Geological Survey, 1997

FLOOD MANAGEMENT

Federal Emergency Management Agency (FEMA)

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Sacramento County identifies numerous locations along the Cosumnes River that are subject to recurring flood events.

Reclamation District 800 (RD 800)

The Reclamation District 800 (RD 800) maintains the integrity of the existing flood control system and designated floodways along the Cosumnes River from a few miles Northeast of Highway 99 to Bridge House. RD 800 board of directors also has the regulatory authority to issue encroachment permits.

WATER RIGHTS

In 1996, a total of 133 water diversion rights currently existed on the Cosumnes River (Philip Williams & Associates, 1997). Multiple water districts and organizations service the Cosumnes River Watershed Basin. However, the majority of the diversion in the Cosumnes River basin is used for grazing and agriculture. Most of the water is pumped from groundwater. In Sacramento County the groundwater table has been falling one foot each year for the past 50 years. Due to rough terrain and the limited water supply most of the area in the upper watershed is non-irrigated (U.S. Army Corps of Engineers, 1991).

Rancho Murieta Community Service District

The primary source of water for Rancho Murieta comes from the Cosumnes River, with a small portion from direct rainfall into the reservoir. State water rights permit diversion for municipal usage only during winter and spring months. Water is diverted from the Cosumnes River at Granlees Dam and pumped into Lakes Calero, Chesbro, and Clementia (reservoirs for Rancho Murieta).

State regulations prohibit any direct discharge of wastewater, by Rancho Murieta, into the Cosumnes River. Regulations require wastewater to be processed through a state-of-the-art tertiary system and used for irrigation of golf courses, parks, and common areas. "Storm water and irrigation runoff is collected in a drainage system throughout the community. Runoff is filtered through detention ponds prior to being returned to the Cosumnes River. In addition, the District maintains the levees that protect the low-lying areas from flooding" (Rancho Murieta CSD, 2001).

The El Dorado Irrigation District, established on October 5, 1925, is a public agency, located in Placerville, primarily dedicated to serving customer needs for water and sewer service in a cost effective and responsible manner. Today, El Dorado Irrigation District serves approximately 29,800 accounts with treated water, 12,850 wastewater accounts and over 40 reclaimed water accounts.

El Dorado Irrigation District

The El Dorado Irrigation District manages Sly Park Recreation Area for the United States Bureau of Reclamation. "El Dorado Irrigation District, as a public entity, it is in effect owned by its resident electors - each of whom is responsible for electing the governing Board and influencing the direction of the Districts' operations. Annually, El Dorado Irrigation District produces "...approximately 25,350 acre feet of treated water, which it receives from three sources and treats approximately 5.2 million gallons of sewage daily at its two wastewater treatment plants. The water reclaimed from its wastewater operations is either sold for turf and irrigation or is discharged into the Deer Creek basin in compliance with the requirements of the California Water Resources Control Board." Sly Park and Jenkinson Lake are located on Sly Park Road five miles South of Pollock Pines and Highway 50 (El Dorado Irrigation District, 2001).

Omochumne-Hartnell Water District

The Sacramento area is served by more than 20 different water districts. Omochumne-Hartnell is one of those. The boundaries range from the North near Rancho Murieta and go South along Grantline road to the far side of Hwy 99, and over (nearly) to Galt.

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CHAPTER 6: SOILS

GENERAL DESCRIPTION

Three Soil Surveys cover the Cosumnes River Watershed: Soil Survey of Amador Area 1965, Soil Survey of El Dorado Area, 1974 and Soil Survey of Sacramento County 1993. At the time the Soil Surveys of Amador and El Dorado Counties were made, a strip of land considered to be part of Sacramento County was not included in either report. The Soil Survey of Sacramento County extends beyond the present Sacramento County line to include this area and join the soil surveys.

STATSGO/SSURGO AVAILABILITY

State Soil Geographic (STATSGO) covers the entire watershed while the most detailed mapping Soil Survey Geographic Database (SSURGO) has been completed in the Sacramento County and Western El Dorado County. There is no scheduled time for completion of the SSURGO mapping for Amador County.

STATSGO

Soil maps for the STATSGO database are made by generalizing the detailed soil survey data. The mapping scale for STATSGO maps in California is 1:250 000. The level of mapping is designed to be used for broad planning and management uses covering state, regional, and multi-state areas.

Digitizing is done by line segment (vector) format in accordance with Natural Resources Conservation Service digitizing standards. The base map used is the U.S. Geological Survey 1:250,000 topographic quadrangles. The number of soil polygons per quadrangle map is between 100 and 400. The minimum area mapped is about 1,544 acres.

STATSGO data are collected in 1:250,000 quadrangle units. Map unit delineation match at state boundaries. States have been joined as one complete seamless database to form statewide coverage. Composition of soil map units was coordinated across state boundaries, so that component identities and relative extents would match.

Each STATSGO map is linked to the Soil Interpretations Record (SIR) attribute database. The attribute database gives the proportionate extent of the component soils and their properties for each map unit. The STATSGO map units consist of 1 to 21 components each. The Soil Interpretations Record database includes over twenty-five physical and chemical soil properties, interpretations, and productivity.

SSURGO

Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. Mapping scales generally range from 1:12,000 to 1:63,360; SSURGO is the most detailed level of soil mapping done by the Natural Resources Conservation Service. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships, and county natural resource planning and management. The user should be knowledgeable of soils data and their characteristics.

Digitizing is done by line segment (vector) format in accordance with Natural Resources Conservation Service digitizing standards. The mapping bases meet national map accuracy standards and are either orthophotoquads or 7.5-minute topographic quadrangles. SSURGO data are collected and archived in 7.5-minute quadrangle units, and distributed as complete coverage for a soil survey area. Soil boundaries ending at quad neatlines are joined by computer to adjoining maps to achieve an exact match.

SSURGO is linked to a Map Unit Interpretations Record (MUIR) attribute database. The attribute database gives the proportionate extent of the component soils and their properties for each map unit. The SSURGO map units consist of 1 to 3 components each. The Map Unit Interpretations Record database includes over 25 physical and chemical soil properties.

Examples of information that can be queried from the database are available water capacity, soil reaction, salinity, flooding, water table, and bedrock; building site development and engineering uses; cropland, woodland, rangeland, pastureland, and wildlife; and recreational development.

Seven soil property maps of the Cosumnes River Watershed were created and included in Phase I of the Resources Inventory: Surface Texture, Soil Erodibility Factor Kf and Kw, Hydrologic Groups, Flooding Frequency and Non-Irrigated and Irrigated Land Capability Class. Other maps of the watershed that can be created using existing information include: Available Water Capacity, Cation Exchange Capacity, Clay Content, Soil Drainage, Liquid Limit, Permeability, Plasticity Index, and Unified Soil Classification. Definitions for all soil properties displayed in this report can be obtained from the National Soil Survey Handbook Subject Index <http://www.statlab.iastate.edu/soils/iissh/subindex.htm>

SOIL SURFACE TEXTURE

The soil surface texture map (Figure 3) shows the location of the various soil textures and/or terms used in lieu of textures and their modifiers for the surface soils in the area.

Definition

Soil texture is based on the USDA system of particle sizes. Texture classes refer to the relative proportion, by weight, of the various size groups of individual mineral soil grains less than 2.0 mm in equivalent diameter. Different percentages of sand, silt and clay give various texture classes. Sometimes terms used in lieu of textures are used for materials that do not fit into a texture class because of the organic matter content, size, rupture resistance, solubility, or other reasons. Examples are the terms muck and fragmental material. Muck refers to organic material. Fragmental material has very few fines between the gravels and cobbles (non-soil). Texture class modifiers are also used to denote the presence of a condition other than the sand, silt or clay combination. Examples are gravelly loam, and mucky silt loam.

Classes

Each texture class has defined limits for each particle separate class of mineral particles less than 2.0 mm in effective diameter. These classes in approximate order of increasing proportions of fine particles are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further subdivided into coarse, fine or very fine. Another category is called variable. This occurs in map units that are higher taxa such as Fluvents, Lithic Xerorthents, Orthents, Xerarents, Xerofluvents, Xerolls, Xeropsamments and miscellaneous land types such as Dumps, Pits, Riverwash, Slickens, and Urban land. The surface textures of these map units are highly variable within short distances.

Significance

Soil texture influences engineering works and plant growth. Soil texture has a strong influence on soil mechanics and the behavior of soil when it is used as construction or foundation material. It influences such engineering properties as bearing strength, compressibility, permeability, shrink-swell potential, and compaction. Engineers are also particularly interested in rock and pararock fragments. Soil texture influences plant growth by its affect on aeration, the water intake rate, the available water capacity, the cation exchange capacity, permeability, erodibility, and workability.

Surface soil texture may reflect differences in the parent material source. For example, the coarse sandy loam surface texture reflects a granitic parent material. Often it will reflect where the soil is on the landscape. In fluvial situations the coarser material is upstream and the finer material is downstream. Textures high in silt tend to occur in basins within the landscape. The muck and mucky modified textures occur in the delta part of the county where water tables are common. Gravelly textures are associated with certain geological formations.

Estimates

Each soil scientist develops the ability to determine soil texture by feel for the local soil survey. They calibrate themselves by comparing their estimates to locally done laboratory tests and by reference samples being sent to the National Soil Survey Center lab. The USDA texture can be measured in the laboratory by determining the proportion of the various size particles in a soil sample. The analytical procedure is called particle-size analysis or mechanical analysis. Stone, gravel, and other material 2.0-mm or larger are sieved out of the sample and do not enter into the analysis of the sample. Their amounts are measured separately. Of the remaining material smaller than 2.0 mm, the amount of the various sizes of sand is determined by sieving. The amount of silt and clay is determined by a differential rate of settling in water. Either the pipette or hydrometer method is used for the silt and clay analysis. Organic matter and dissolved mineral matter are removed in the pipette procedure but not in the hydrometer procedure. The two procedures are generally very similar, but a few samples, especially those with high organic matter or high soluble salts, exhibit wide discrepancies.

FIGURE 3 SOIL SURFACE TEXTURE

SOIL ERODIBILITY FACTORS - Kf AND Kw

The Kf (Figure 3) and Kw (Figure 4) maps show the variability of the dominant surface soil in each map unit for the soil erodibility factor of the Universal Soil Loss Equation (USLE) (Renard, K.G., et al., 1997).

Definition

Kf and Kw are soil erodibility factors that quantify the susceptibility of soil detachment by water. Kf considers only the fine-earth fraction (<2.0 mm in diameter) of the soil. Kw or sometimes just referred to as K considers the whole soil, i.e. with its rock fragments such as gravels and cobbles. It is the rate of soil loss per rainfall erosion index unit as measured on a unit plot. In practical terms, it is the average long-term soil and soil-profile response to the erosive powers of rainstorms. Thus, it is the summation effects of a large number of erosion and hydrologic processes such as soil detachment and transport by raindrop impact and surface flow, localized deposition due to topography and tillage-induced roughness, and rainwater infiltration into the soil profile.

Classes

Kw factors obtained experimentally vary from 0.02 to 0.69. For the purpose of soil interpretations the factors have been grouped into 14 classes as follows: 0.02, 0.05, 0.10, 0.15, 0.17, 0.20, 0.24, 0.28, 0.32, 0.37, 0.43, 0.49, 0.55, and 0.64 (USDA-Natural Resources Conservation Service, 1996).

Significance

Soil erodibility factor Kf and Kw are used in the erosion prediction equations USLE and RUSLE. Soil properties that influence rainfall erosion are those that affect infiltration rate, movement of water through the soil, and water storage capacity and those that affect dispersion, detachability, abrasion, and mobility of soil particles by rainfall and runoff. Some of the most important properties are texture, organic matter content, size and stability of structural aggregates in the exposed layer, permeability of the subsoil and depth to a slowly permeable layer.

Estimates

Kf factors can be measured by applying a series of simulated rainstorms on freshly tilled plots. The direct measurement of the erodibility factor is both costly and time consuming and has been conducted for only a few major soils. A more common way is to make estimates of Kf by the use of a soil erodibility nomograph. The nomograph integrates the relationship between the Kf factor and five soil properties: (1) percent silt plus very fine sand, (2) percent sand greater than 0.10 mm, (3) organic matter content, (4) structure, and (5) permeability. Rock fragments are not considered in the nomograph. The nomograph gives Kf values and these need to be adjusted downward if rock fragments occur to give the Kw values. Soil textures that do not have rock

fragments have equal K_w and K_f factors. Where rock fragments are present, K_w is always less than K_f .

FIGURE 4 SOIL ERODIBILITY FACTORS - Kf

FIGURE 5 SOIL ERODIBILITY FACTORS - KW

HYDROLOGIC GROUPS

The Hydrologic Groups map (Figure 6) shows the hydrologic group of the soils for the dominant soil in each map unit.

Definition

Hydrologic group is a group of soils having similar runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer (USDA-Natural Resources Conservation Service, 1996). The influence of ground cover is treated independently.

Classes

The soils in the United States are placed into four groups, A, B, C, and D and three dual classes, A/D, B/D, and C/D. In the definitions of the classes, infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. Transmission rate is the rate at which water moves in the soil and is controlled by soil properties. Definitions of the classes are as follows:

A. (Low runoff potential). The soils have a high infiltration rate even when thoroughly wetted. They chiefly consist of deep, well drained to excessively drained sands or gravels. They have a high rate of water transmission.

B. The soils have a moderate infiltration rate when thoroughly wetted. They chiefly are moderately deep to deep, moderately well drained to well-drained soils that have moderately fine to moderately coarse textures. They have a moderate rate of water transmission.

C. The soils have a slow infiltration rate when thoroughly wetted. They chiefly have a layer that impedes downward movement of water or have moderately fine to fine texture. They have a slow rate of water transmission.

D. (High runoff potential). The soils have a very slow infiltration rate when thoroughly wetted. They chiefly consist of clay soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. They have a very slow rate of water transmission.

E. Dual hydrologic groups, A/D, B/D, and C/D are given for certain wet soils that can be adequately drained. The first letter applies to the drained condition, the second to the undrained. Only soils that are rated D in their natural condition are assigned to dual classes. Soils may be assigned to dual groups if drainage is feasible and practical.

1. Chapter 7 of the Natural Resource Conservation Service National Engineering Handbook-4, Hydrology, discusses specific hydrologic groups of soils (Soil Conservation Service, 1972).

Significance

Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for planning or designing structures for the use, control, and disposal of water.

Measurements

The original classifications assigned to soils were based on the use of rainfall-runoff data from small watersheds and infiltrometer plots. From these data, relationships between soil properties and hydrologic groups were established.

Estimates

Assignment of soils to hydrologic groups is based on the relationship between soil properties and hydrologic groups. Wetness characteristics, permeability after prolonged wetting, and depth to very slowly permeable layers are properties that assist in estimating hydrologic groups.

FIGURE 6 HYDROLOGIC GROUPS

FLOODING FREQUENCY

The Flooding Frequency map (Figure 7) shows the frequency of flooding of the soil for the dominant soil in each map unit.

Definition

Flooding is the temporary covering of the soil surface by flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources (Soil Survey Staff, 1996). Shallow water standing or flowing that is not concentrated as local runoff during or shortly after rain or snowmelt is excluded from the definition of flooding. Chapter 3 of the *Soil Survey Manual* provides additional information (Soil Survey Division Staff, 1993). Standing water (ponding) or water that forms a permanent covering is also excluded from the definition. Flooding entries reflect the current existing and mapped condition with consideration for dams, levees, and other man-induced changes affecting flooding frequency and duration.

Classes

Estimates of flooding class are based on the interpretation of soil properties and other evidence gathered during soil survey fieldwork. Flooding hazard is expressed by flooding frequency class, flooding duration class, and time of year that flooding occurs. Not considered here, but nevertheless important, are velocity and depth of floodwater. Frequencies used to define classes are generally estimated from evidence related to the soil and vegetation. They are expressed in wide ranges that do not indicate a high degree of accuracy. Flooding frequencies that are more precise can be calculated by performing complex analyses used by engineers. The class very frequent is intended for use on areas subject to daily and monthly high tides.

1. Flooding frequency Class

Flooding frequency class is the number of times flooding occurs over a period of time and expressed as a class. The classes of flooding are defined as follows:

None - No reasonable possibility of flooding: near 0 percent chance of flooding in any year or less than 1 in 500 years.

Very Rare - Flooding is very unlikely but possible under extremely unusual weather conditions; less than 1 percent chance of flooding in any year or less than 1 time in 100 years but at least 1 time in 500 years.

Rare - Flooding is expected infrequently under unusual weather conditions; 1 to 5 percent chance of flooding in any year or nearly 1 to 5 times in 100 years.

Occasional - Flooding is expected infrequently under usual weather conditions; >5 to 50 percent chance of flooding in any year or >5 to 50 times in 100 years.

Frequent - Flooding is likely to occur often under usual weather conditions; more than a 50 percent chance of flooding in any year or more than 50 times in 100 years, but less than a 50 percent chance of flooding in all months in any year.

Very Frequent - Flooding is likely to occur very often under usual weather conditions, more than a 50 percent chance of flooding in all months of any year.

2. Assignment

Yearly flooding frequency classes are assigned to months to indicate the months of occurrence and not the frequency of the flooding during the month, except for the very frequent class. The time period expressed includes two-thirds to three-fourths of the occurrences. Time period and duration of the flood are the most critical factors that determine the growth and survival of a given plant species. Flooding during the dormant season has few if any harmful effects on plant growth or mortality and may improve the growth of some species. If inundation from floodwater occurs for long periods during the growing season, the soil becomes oxygen deficient and plants may be damaged or killed.

Significance

The susceptibility of soils to flooding is an important consideration for building sites, sanitary facilities, and other uses. Floods may be less costly per unit area of farmland as compared to that of urban land, but the loss of crops and livestock can be disastrous.

Estimates

The most precise evaluation of flood-prone areas for stream systems is based on hydrologic studies. The area subject to inundation during a flood of a given frequency, such as one with a 1 percent or 2 percent chance of occurrence, generally is determined by one of two basic methods.

1. The first method is used if stream flow data are available. In this method, the data are analyzed to determine the magnitude of floods of different frequencies. Engineering studies are made to determine existing channel capacities and flow on the flood plain by the use of valley cross sections and water surface profiles.
2. The second method is used if stream flow data are not available. In this method, hydrologists make an estimate of flood potential from recorded data on rainfall. They consider such factors as (i) size, slope, and shape of the contributing watershed, (ii) hydrologic characteristics of the soil, (iii) land use and treatment, and (iv) hydraulic characteristics of the valley and channel system.
3. With the use of either method, soil surveys can aid in the delineation of flood-prone areas. Possible sources of flooding information are (i) Natural Resource Conservation Service project-type studies, such as PL 556, FP, RB, or Resource Conservation and Development (RC&D); (ii) flood hazard analyses; (iii) Corps of Engineers flood plain information reports; (iv) special flood reports, (v) local flood protection and flood control project reports; (vi) HUD flood insurance study reports; (vii) maps by U.S. Geological Survey (USGS), Natural

Resource Conservation Service, TVA, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration (NOAA); (viii) studies by private firms and other units of government, and (ix) U.S. Geological Survey quadrangle sheets and hydrologic atlases of flood-prone areas and stream gauge data.

4. General estimates of flooding frequency and duration are made for each soil. However, in intensively used areas where construction has materially altered the natural water flow, flood studies are needed to adequately reflect present flooding characteristics. Duration is estimated to the nearest hour up to 48 hours, then it is estimated to the nearest day.
5. Soil scientists collect and record evidence of flood events during the course of the soil survey. The extent of flooded areas, flood debris in trees, damage to fences and bridges, and other signs of maximum water height are recorded. Information that is helpful in delineating soils that have a flood hazard is also obtained. Hydrologists may have flood stage predictions that can be related to kinds of soil or landscape features. Conservationists and engineers may have recorded elevations of high flood marks. Local residents may have recollections of floods that can help to relate the events to kinds of soil, topography, and geomorphology.
6. Certain landscape features have developed as the result of past and present flooding and include former river channels, oxbows, point bars, alluvial fans, meander scrolls, sloughs, natural levees, backswamps, sand splays, and terraces. Most of these features are easily recognizable on aerial photographs by comparing the photo image with on-the ground observations. Different kinds of vegetation and soils are normally associated with these geomorphic features.
7. The vegetation that grows in flood areas may furnish clues to past flooding. In central and southeastern United States, the survival of trees in flood-prone areas depends on the frequency, duration, depth, and time of flooding and on the age of the tree.
8. Past flooding may sometimes leave clues in the soil, such as (i) thin strata of material of contrasting color or texture, or both; (ii) an irregular decrease in organic matter content, which is an indication of a buried surface horizon; and (iii) soil layers that have abrupt boundaries to contrasting kinds of material, which indicate that the materials were laid suddenly at different times and were from different sources or were deposited from stream flows of different velocities.
9. Laboratory analyses of properly sampled layers are often helpful in verifying these observations. Organic carbon and particle-size analyses are particularly useful in verifying flood deposits. Microscopic observations may detect preferential horizontal orientation of platelike particles; microlayering, which indicates water-laid deposits; or mineralogical differences between layers.

FIGURE 7 FLOODING FREQUENCY

LAND CAPABILITY CLASS

This map shows the Non-Irrigated (Figure 8) and the Irrigated (Figure 9) Capability Classes of the dominant soil in each unit for the area.

Definition

The Land Capability Classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time. They allow users to plan reasonable alternatives for the use and management of the soils.

Classes

The Land Capability Classification system is subdivided into capability class, subclass, and units. Only the class level of classification is presented here. This is the broadest category. Classes 1,2,3,4,5,6,7 and 8 are used for both irrigated and non-irrigated situations. Selected soil criteria are used to determine the rating. Class 1 has the fewest limitations with class 8 having the most limitations. The concepts of the classes are as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or require very careful management, or both.

Class 5 soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class 6 soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class 7 soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.

Class 8 soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for esthetic purposes.

Significance

This system is widely adopted for agriculture planning. The USDA Natural Resources Conservation Service Field Office Technical Guide (FOTG) uses this system for planning. It shows, in a general way, the suitability of the soils for most kinds of field crops. From the Capability Classification system one can infer much about the behavior of the soil when used for growing crops.

Estimates

All map unit components are assigned a capability class. Non-irrigated values are always given for each component and if the soil has potential for being irrigated, an irrigated class is also given. Factors used for placing soils into a Land Capability class in California are: effective soil depth, Thornwaite's climate index of ETp 32 degrees F when irrigated, Thornwaite's climate index 4ETa when non-irrigated, surface texture-irrigated, surface texture non-irrigated, permeability, drainage class, available water holding capacity, slope, erosion hazard, flooding hazard, salinity, sodicity, toxic substances, and frost-free season.

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Section II.

FIGURE 8 NON-IRRIGATED CAPABILITY CLASS

FIGURE 9 IRRIGATED CAPABILITY CLASS

CHAPTER 7: SEDIMENT

Channel condition is an integrating factor that provides the link between watershed practices and their effect on aquatic resources. Poor channel condition is often a limiting factor for fish, aquatic invertebrates, and riparian communities.

PREDICTED SEDIMENT PRODUCTION

As part of the Sierra Nevada Ecosystem Project case study, the U.S. Forest Service assessed the relative sediment production of fifty years of land use (1940-1991) in Camp Creek and Clear Creek Basins. The Camp Creek Basin encompasses 20,821 acres, ranges in elevation from 3,200 to 7,600 feet and is managed by the Eldorado National Forest. Clear Creek Basin encompasses 7,580 acres, ranges in elevation from 1,680 to 4,100 feet and has been heavily developed with low-density housing.

The primary disturbances in Camp Creek are road building, logging and fire. The primary disturbances in Clear Creek are road building, residential development, and fire. Roads produce the bulk of the sediment in both basins. Because roads produce the bulk of the sediment it was suggested that additional information on road erosion be the highest priority (McGurk, et al. 1996).

ROAD EROSION

On September 28, 1998 the Eldorado National Forest and Colorado State University entered into an agreement to begin work on assessing cumulative watershed effects. Colorado State University set out to (1) review existing methodologies to assess cumulative watershed effects; (2) compile data on site conditions and management activities in selected basins; (3) set up sites to measure sediment production from a range of management activities; and (4) prepare a brief report summarizing the results of the initial work. Fifty-three silt fences were set up on fifteen streams. Surprisingly, the initial data show that there is no correlation between road density and the amount of fine sediment in pools, even though the preliminary silt fence data showed that most of the sediment was being generated by roads rather than harvest activities. Initial studies also indicated that the amount of eroding banks is weakly related to geology, but is not significantly correlated with any of the other site or management variables. More intensive analysis is needed to verify these preliminary results (MacDonald, Lee, 2001).

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CHAPTER 8: GEOLOGY-LANDSLIDES

Sierra Nevada is 50 to 80 miles wide and about 400 miles long, extending from the Cascade Range southward to the Mojave Desert. The Sierra is a block of the earth's crust that has been tilted westward along a steep fault escarpment on the east flank. Relatively gentle slopes have developed along the west flank of the range. The tilting is the result of asymmetric uplift of the fault block; the most recent episode occurring during the last 4 to 5 million years. In response to the uplift, the Cosumnes and other modern Sierran rivers have cut deep, west trending, steep-walled canyons (Wagner and Spittler, 1997).

Travelling east to west up the Cosumnes River one leaves the Cenozoic nonmarine sedimentary rocks and alluvial deposits of the Great Central Valley crossing Mesozoic sedimentary and volcanic rocks - Paleozoic sedimentary and volcanic rocks - arriving at the top of the watershed in Granitic rocks chiefly of Mesozoic age. Crossing the Mesozoic rocks one crosses the West Bear Mountain fault, the East Bear Mountain fault, and the Melones fault. Five tectonic belts lie between the Cenozoic cover of the Great Valley and the continuous assemblage of Cretaceous plutonic rocks (Mesozoic age) that constitute the Sierran batholith. Each belt is fault bounded and records differing histories of sedimentation, volcanism, plutonism, metamorphism, deformation, and uplift. Not until Cenozoic time did the basement rocks respond to tectonic activity as a single unit and even that supposition may be questioned (Jones et. al. 1997).

WESTERN BELT

The Western belt is a structurally complex assemblage of arc-derived volcanic rocks interspersed with thick units of fine-grained clastic rocks (flysch), mostly altered to slate.

SHINGLE SPRINGS COMPLEX

The Shingle Spring Complex includes a wide variety of metamorphic and plutonic rocks bounded by the eastern and western strands of the Bear Mountain fault zone.

PLACERVILLE BELT

The Placerville belt, with the advent of tectonic theory, (Blake et al. 1982) divided the Sierra Foothills into terranes. Some terranes are equivalent to lithotectonic belts, while others are not.

CALAVERAS BELT

The Calaveras belt is East of the Melones fault, another persistent belt composed of volcanic and

sedimentary rocks extends nearly the entire length of the foothills. The dominant rocks present are slate and phyllite, marble, quartzose metasandstone, greenstone, and at the structural base of the assemblage, a belt of augiteporphyry meta andesite.

FEATHER RIVER BELT

The Feather River belt is an assemblage of serpentinite, gabbro, and other ophiolite rocks bounds the eastern limit of the Calaveras belt and separates that assemblage from the extensive Shoo fly complex to the east.

SHOO FLY COMPLEX

The Shoo Fly complex, a vast assemblage of quartzose metamorphosed sedimentary rocks lie east of the Feather River untramaflc belt and makes up the bulk of the country rock intruded by the Cretaceous batholith in the central Sierra Nevada.

Landslide features occurring in the watershed include Translational/Rotational Slides, Earthflows, Debris Slides, and Debris Flows. Debris Flows have increased the most due to man's activities in the last 200 years. Topographic swales are commonly the sources of material for debris flows in the watershed. Granitic bedrock is typically deeply weathered to grus (decomposed granite) within swales. Many swales are controlled by intersecting joint sets in the underlying bedrock. The combined influence of out-of-slope projection of joint-defined wedges, weakening of bedrock through decomposition, and relatively steep ground results in unstable slopes. Most current debris flows have source areas in colluvium filled swales; many developed above intersecting joint sets (Wagner and Spittler 1997).

REFERENCES

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CHAPTER 9: WATER QUALITY

“Water quality in the Cosumnes River watershed is affected by several factors including climate, geology, soils, vegetation and land-use. Understanding water quality at the large watershed scale is a critical first step for determining whether activities in the upper watershed are likely to have an impact on ecosystem health and restoration efforts in the lower watershed and the Bay-Delta” (D.A. Ahearn and R.A. Dahlgren, 2000).

Water quality problems included pollutants from Keifer Landfill, croplands, animal facilities and mercury from old mines are a problem. Additionally, water quantity is a concern due to the increased construction activities within the watershed. Construction activities can lead to an increase in erosion, and decreased groundwater regeneration due to the increased impervious surfaces and the additional water supply required for the occupants of the new developments. “Since development, groundwater elevations near the Cosumnes River have declined on the order of 60 feet; this change probably caused the river flow in the lower reaches to become seasonal, rather than perennial” (Philip Williams & Associates, LTD., 1997).

REFERENCES

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CHAPTER 10: BIOLOGY AND WILDLIFE

BIOLOGY AND WILDLIFE DATA

There are several sources of information for determining known and predicted biological habitat and wildlife species for California. These can be queried by County, Quadrangle, and sometimes by spatially within a GIS data layer to a specific watershed. For the Cosumnes River watershed project the following were reviewed from the following sources:

- California Habitat Wildlife Relationships Model
- California Natural Diversity Database
- U.S. Fish and Wildlife species lists
- Department of Fish and Game species lists

California Wildlife Habitat Relationships

The most common tool for determining the animal species likely to occur in a given county, including species of special concern (such as Federal and State threatened and endangered species), is the California Wildlife Habitat Relationship model. This model will identify bird, amphibian, reptile and mammal species for a particular geographic area based upon habitat types and other input. However, this model does not include invertebrate species, fish, or plants. Therefore this list is not complete since it does not predict all species possible. Version 7.0 of the CWHR was produced in 1999, and therefore is not currently up to date.

California Wildlife Habitat Relationships (CWHR) is an information system for California's wildlife. CWHR contains life history, management, and habitat relationship information on 675 species of amphibians, reptiles, birds, and mammals known to occur in the state. The information in CWHR is based on current published and unpublished biological information and professional judgement by recognized experts on California wildlife. Because of the predictive nature of its models, CWHR has many applications for wildlife resource issues, including wildlife population, community, and habitat conservation and management, land use planning, impact assessment, education, and research. More information can be found at:
<http://www.dfg.ca.gov/whdab/html/cwhr.html>

California Natural Diversity Database

The California Department of Fish and Game maintains the California Natural Diversity Database, which lists all known sightings of species of special concern. However, species may occur in an area where they have not yet been sighted and recorded. So this list is incomplete for planning purposes. The date of the data used in this analysis was July 2001.

The California Natural Diversity Database (CNDDB) is a statewide inventory of the locations and condition of the state's rarest species and natural communities. The CNDDB is a "heritage program" and is part of the National Heritage Network, a nationwide network of similar

programs established by The Nature Conservancy. Their goal is to provide the most current information on the state's most imperiled elements of natural diversity and to provide tools to analyze these data. by continually refining and updating the computerized inventory of location and condition information on California's rarest plants, animals, and natural communities. CNDDDB data are organized geographically and taxonomically. Information can be retrieved by taxa or by U.S. Geological Survey map sheet (1:24,000, 1:62,500, 1:100,000 or 1:250,000 scale). More information can be found at: <http://www.dfg.ca.gov/whdab/html/cnddb.html>.

United States Fish and Wildlife Service

The U.S. Fish and Wildlife list of Federally Threatened and Endangered species does list all plant and animal species of special concern by State. However, it does not separate species out by habitat type or geographic area, such as county. This list is updated constantly, and when accessed online states that it is current as of the date of access. The most recent up-to-the-day list can be found at <http://endangered.fws.gov/wildlife.html>.

Department of Fish and Game

The California Department of Fish and Game, Habitat Conservation Division, Wildlife and Habitat Data Analysis Branch, California Natural Diversity Database also provides quarterly updated lists of State and Federally Listed Endangered and Threatened Animals of California, and State And Federally Listed Endangered, Threatened, and Rare Plants of California. The most recent update may be accessed at <http://www.dfg.ca.gov/whdab/html/lists.html>.

INTEGRATION AND ANALYSIS

What this means is that these four sources of species information must be combined to get a complete plant and animal species list for a specific geographic area. The California Habitat Relationship model predicts what species are likely to occur in the watershed, based on the vegetation and habitat in the area. Simply because a species has not been observed in the watershed does not mean it is not there. This is especially important for listed species, and species of special concern. The U.S. Fish and Wildlife Service provides lists of species by U.S. Geological Survey 7.5 minute quadrangles, indicating species that occur within the quad, but that does not mean they occur in a given watershed. However, knowledge of the watershed's habitats and the predictions of the California Wildlife Habitat Relationships combine to give a picture of species likely to occur. Of particular importance are mobile species such as birds or bats that may live in adjacent areas. Other species of concern are the ones for which there is very little information, such as invertebrates and amphibians. Again, a lack of information about a species does not mean they do not exist. Therefore, special consideration should be given for these species, for which habitat exists, but no observations have been made.

California Wildlife Habitat Relationships Cosumnes River Watershed Habitat and Species Results

TABLE 5: COSUMNES RIVER WATERSHED – CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS (BY COUNTY) -- MAY 29, 2002

EL DORADO	AMADOR	SACRAMENTO
ALPINE DWARF-SHRUB	/	/
ANNUAL GRASS	ANNUAL GRASS	ANNUAL GRASS
ASPEN	ASPEN	/
BARREN	BARREN	BARREN
BITTERBRUSH	/	/
BLUE OAK WOODLAND	BLUE OAK WOODLAND	BLUE OAK WOODLAND
BLUE OAK-FOOTHILL PINE	BLUE OAK-FOOTHILL PINE	BLUE OAK-FOOTHILL PINE
CHAMISE-REDSHANK CHAPARRAL	CHAMISE-REDSHANK CHAPARRAL	CHAMISE-REDSHANK CHAPARRAL
CLOSED-CONE PINE- CYPRESS	/	/
/	/	COASTAL OAK WOODLAND
DECIDUOUS ORCHARD	DECIDUOUS ORCHARD	DECIDUOUS ORCHARD
DRYLAND GRAIN CROPS	/	DRYLAND GRAIN CROPS
EASTSIDE PINE	/	/
/	/	ESTUARINE
EUCALYPTUS	EUCALYPTUS	EUCALYPTUS
FRESH EMERGENT WETLAND	FRESH EMERGENT WETLAND	FRESH EMERGENT WETLAND
IRRIGATED GRAIN CROPS	/	IRRIGATED GRAIN CROPS
IRRIGATED HAYFIELD	IRRIGATED HAYFIELD	IRRIGATED HAYFIELD
IRRIGATED ROW AND FIELD CROPS	IRRIGATED ROW AND FIELD CROPS	IRRIGATED ROW AND FIELD CROPS
JEFFREY PINE	JEFFREY PINE	/
JUNIPER	/	/
LACUSTRINE	LACUSTRINE	LACUSTRINE
LODGEPOLE PINE	LODGEPOLE PINE	/
LOW SAGE	/	/
MIXED CHAPARRAL	MIXED CHAPARRAL	MIXED CHAPARRAL
MONTANE CHAPARRAL	MONTANE CHAPARRAL	/
MONTANE HARDWOOD	MONTANE HARDWOOD	MONTANE HARDWOOD
MONTANE HARDWOOD- CONIFER	MONTANE HARDWOOD- CONIFER	/
MONTANE RIPARIAN	MONTANE RIPARIAN	/
PASTURE	PASTURE	PASTURE
PERENNIAL GRASS	PERENNIAL GRASS	PERENNIAL GRASS
PONDEROSA PINE	PONDEROSA PINE	/
RED FIR	RED FIR	/
RIVERINE	RIVERINE	RIVERINE
SAGEBRUSH	SAGEBRUSH	/

SIERRAN MIXED CONIFER	SIERRAN MIXED CONIFER	/
SUBALPINE CONIFER	SUBALPINE CONIFER	/
URBAN	URBAN	URBAN
VALLEY FOOTHILL	VALLEY FOOTHILL	VALLEY FOOTHILL
RIPARIAN	RIPARIAN	RIPARIAN
VALLEY OAK WOODLAND	VALLEY OAK WOODLAND	VALLEY OAK WOODLAND
VINEYARD	VINEYARD	VINEYARD
WET MEADOW	WET MEADOW	/
WHITE FIR	WHITE FIR	/

The California Wildlife Habitat Relationships query for Amador, El Dorado and Sacramento counties resulted in a list of 407 species that are predicted to occur in those counties based on Habitat Types. Of these, Amador County predicts 351 species; El Dorado County predicts 377 species; and Sacramento County predicts 309 species. Again, these predictions are based on Habitat type, and do not include plant species, except as they are part of the Habitat types used to predict animal species. Because these predictions have been made at the county level, and not at the watershed boundary, some species may be included that do not in fact occur within the watershed. Further assessment and study will be needed to determine these.

Of these, the status numbers indicate which are common species, which are Federally listed, and which are of special concern to the State.

The following table California Wildlife Habitat Relationships (CWHR) Species Summary Report for Amador, El Dorado and Sacramento Counties was compiled with the following Single Condition Query in the CWHR (California Wildlife Habitat Relationship System - 11/26/2001. Supported by California Interagency Wildlife Task Group and maintained by the California Department of Fish and Game. Database Version: 7.0. This copy of the Database is licensed to: USDA Natural Resource Conservation District):

Location: Amador, El Dorado, and Sacramento
Habitats: none (defaults to all)
Elements to Exclude: none
Available Species: all (default)
Status Selection: none (defaults to all)
Season Selection: none (defaults to all)

TABLE 6: CALIFORNIA WILDLIFE HABITAT RELATIONSHIP SPECIES SUMMARY REPORT RESULTS FOR AMADOR, EL DORADO AND SACRAMENTO COUNTIES

STATUS

1=Fed Endangered	5=Ca Fully Protected	8=Fed Prop Endangered	12=USFS Sensitive
2=Fed Threatened	6=Ca Protected	9=Fed Prop Threatened	13=CDF Sensitive
3=Ca Endangered	7=Ca Species of Special	10=Fed Candidate	14=Harvest
4=Ca Threatened	Concern	11=BLM Sensitive	

ID	SPECIES NAMES	STATUS
A047	TIGER SALAMANDER	
A001	CALIFORNIA TIGER SALAMANDER	6, 7, 10
A003	LONG-TOED SALAMANDER	1, 3, 5, 6
A007	CALIFORNIA NEWT	7
A012	ENSATINA	7, 12
A022	ARBOREAL SALAMANDER	
A014	CALIFORNIA SLENDER SALAMANDER	
A023	MOUNT LYELL SALAMANDER	6, 7
A028	WESTERN SPADEFOOT	6, 7
A032	WESTERN TOAD	
A033	YOSEMITE TOAD	6, 7, 12
A039	PACIFIC CHORUS FROG	
A040	RED-LEGGED FROG	2, 6, 7, 12
A043	FOOTHILL YELLOW-LEGGED FROG	6, 7, 12
A044	MOUNTAIN YELLOW-LEGGED FROG	6, 7, 12
A045	NORTHERN LEOPARD FROG	7, 12
A046	BULLFROG	14
R004	WESTERN POND TURTLE	6, 7, 12
R003	SLIDER	
R022	WESTERN FENCE LIZARD	
R023	SAGEBRUSH LIZARD	
R029	COAST HORNED LIZARD	6, 7, 12
R036	WESTERN SKINK	7
R037	GILBERT'S SKINK	
R039	WESTERN WHIPTAIL	
R040	SOUTHERN ALLIGATOR LIZARD	
R042	NORTHERN ALLIGATOR LIZARD	
R046	RUBBER BOA	4, 6, 12
R048	RINGNECK SNAKE	12
R049	SHARP-TAILED SNAKE	
R051	RACER	
R053	STRIPED RACER	2, 4, 6
R057	GOPHER SNAKE	7
R058	COMMON KINGSNAKE	
R059	CALIFORNIA MOUNTAIN KINGSNAKE	6, 7, 12
R060	LONG-NOSED SNAKE	
R061	COMMON GARTER SNAKE	1, 3, 5, 6, 7
R062	WESTERN TERRESTRIAL GARTER SNAKE	
R063	WESTERN AQUATIC GARTER SNAKE	2, 4
R079	GIANT GARTER SNAKE	2, 4, 6
R071	NIGHT SNAKE	
R076	WESTERN RATTLESNAKE	
B003	COMMON LOON	7
B006	PIED-BILLED GREBE	
B007	HORNED GREBE	
B009	EARED GREBE	
B010	WESTERN GREBE	
B548	CLARK'S GREBE	

B042	AMERICAN WHITE PELICAN	7
B044	DOUBLE-CRESTED CORMORANT	7
B049	AMERICAN BITTERN	
B050	LEAST BITTERN	7
B051	GREAT BLUE HERON	13
B052	GREAT EGRET	13
B053	SNOWY EGRET	
B057	CATTLE EGRET	
B058	GREEN HERON	
B059	BLACK-CROWNED NIGHT HERON	
B062	WHITE-FACED IBIS	7
B603	WOOD STORK	1, 7
B108	TURKEY VULTURE	
B070	GREATER WHITE-FRONTED GOOSE	14
B071	SNOW GOOSE	14
B072	ROSS' GOOSE	14
B075	CANADA GOOSE	2, 14
B067	TUNDRA SWAN	
B076	WOOD DUCK	14
B085	GADWALL	14
B086	EURASIAN WIGEON	14
B087	AMERICAN WIGEON	14
B079	MALLARD	14
B082	BLUE-WINGED TEAL	14
B083	CINNAMON TEAL	14
B084	NORTHERN SHOVELER	14
B080	NORTHERN PINTAIL	14
B077	GREEN-WINGED TEAL	14
B089	CANVASBACK	14
B090	REDHEAD	14
B091	RING-NECKED DUCK	14
B093	GREATER SCAUP	14
B094	LESSER SCAUP	14
B096	HARLEQUIN DUCK	7, 14
B103	BUFFLEHEAD	14
B101	COMMON GOLDENEYE	14
B102	BARROW'S GOLDENEYE	7, 14
B104	HOODED MERGANSER	14
B105	COMMON MERGANSER	14
B106	RED-BREASTED MERGANSER	14
B107	RUDDY DUCK	14
B110	OSPREY	7, 13
B111	WHITE-TAILED KITE	5
B113	BALD EAGLE	2, 3, 5, 13
B114	NORTHERN HARRIER	7
B115	SHARP-SHINNED HAWK	7
B116	COOPER'S HAWK	7
B117	NORTHERN GOSHAWK	7, 12, 13
B119	RED-SHOULDERED HAWK	

B121	SWAINSON'S HAWK	4, 12
B123	RED-TAILED HAWK	
B124	FERRUGINOUS HAWK	7
B125	ROUGH-LEGGED HAWK	
B126	GOLDEN EAGLE	5, 7, 13
B127	AMERICAN KESTREL	
B128	MERLIN	7
B129	PEREGRINE FALCON	1, 3, 5, 13
B131	PRAIRIE FALCON	7
B133	RING-NECKED PHEASANT	14
B134	BLUE GROUSE	14
B138	WILD TURKEY	14
B141	MOUNTAIN QUAIL	14
B140	CALIFORNIA QUAIL	14
B143	BLACK RAIL	4, 5
B145	VIRGINIA RAIL	
B146	SORA	
B148	COMMON MOORHEN	14
B149	AMERICAN COOT	14
B150	SANDHILL CRANE	4, 5, 12
B151	BLACK-BELLIED PLOVER	
B629	PACIFIC GOLDEN-PLOVER	
B154	SNOWY PLOVER	2, 7
B156	SEMIPALMATED PLOVER	
B158	KILLDEER	
B159	MOUNTAIN PLOVER	7, 10
B163	BLACK-NECKED STILT	
B164	AMERICAN AVOCET	
B165	GREATER YELLOWLEGS	
B166	LESSER YELLOWLEGS	
B168	WILLET	
B170	SPOTTED SANDPIPER	
B172	WHIMBREL	
B173	LONG-BILLED CURLEW	7
B176	MARbled GODWIT	
B177	RUDDY TURNSTONE	
B181	SANDERLING	
B183	WESTERN SANDPIPER	
B185	LEAST SANDPIPER	
B648	BAIRD'S SANDPIPER	7
B649	PECTORAL SANDPIPER	
B191	DUNLIN	
B196	SHORT-BILLED DOWITCHER	
B197	LONG-BILLED DOWITCHER	
B199	COMMON SNIPE	14
B200	WILSON'S PHALAROPE	
B655	RED-NECKED PHALAROPE	
B211	BONAPARTE'S GULL	
B213	MEW GULL	

B214	RING-BILLED GULL	
B215	CALIFORNIA GULL	7
B216	HERRING GULL	
B217	THAYER'S GULL	
B221	GLAUCOUS-WINGED GULL	
B227	CASPIAN TERN	
B231	COMMON TERN	
B233	FORSTER'S TERN	
B235	BLACK TERN	7
B250	ROCK DOVE	
B251	BAND-TAILED PIGEON	14
B255	MOURNING DOVE	14
B260	GREATER ROADRUNNER	
B262	BARN OWL	
B263	FLAMMULATED OWL	
B264	WESTERN SCREECH OWL	
B265	GREAT HORNED OWL	
B267	NORTHERN PYGMY OWL	
B269	BURROWING OWL	7
B270	SPOTTED OWL	2, 7, 11, 12, 13
B271	GREAT GRAY OWL	3, 12,13
B272	LONG-EARED OWL	7
B273	SHORT-EARED OWL	7
B274	NORTHERN SAW-WHET OWL	
B275	LESSER NIGHTHAWK	
B276	COMMON NIGHTHAWK	
B277	COMMON POORWILL	
B279	BLACK SWIFT	7
B281	VAUX'S SWIFT	7
B282	WHITE-THROATED SWIFT	
B286	BLACK-CHINNED HUMMINGBIRD	
B287	ANNA'S HUMMINGBIRD	
B289	CALLIOPE HUMMINGBIRD	
B291	RUFIOUS HUMMINGBIRD	
B292	ALLEN'S HUMMINGBIRD	
B293	BELTED KINGFISHER	
B294	LEWIS' WOODPECKER	
B296	ACORN WOODPECKER	
B300	WILLIAMSON'S SAPSUCKER	
B299	RED-BREASTED SAPSUCKER	
B302	NUTTALL'S WOODPECKER	
B303	DOWNY WOODPECKER	
B304	HAIRY WOODPECKER	
B305	WHITE-HEADED WOODPECKER	
B306	BLACK-BACKED WOODPECKER	
B307	NORTHERN FLICKER	3
B308	PILEATED WOODPECKER	
B309	OLIVE-SIDED FLYCATCHER	
B311	WESTERN WOOD-PEWEE	

B315	WILLOW FLYCATCHER	1, 3, 12
B317	HAMMOND'S FLYCATCHER	
B319	GRAY FLYCATCHER	
B318	DUSKY FLYCATCHER	
B320	PACIFIC-SLOPE FLYCATCHER	
B321	BLACK PHOEBE	
B323	SAY'S PHOEBE	
B326	ASH-THROATED FLYCATCHER	
B333	WESTERN KINGBIRD	
B410	LOGGERHEAD SHRIKE	1, 7
B409	NORTHERN SHRIKE	
B554	PLUMBEOUS VIREO	
B415	CASSIN'S VIREO	
B417	HUTTON'S VIREO	
B418	WARBLING VIREO	
B346	STELLER'S JAY	
B348	WESTERN SCRUB-JAY	7
B349	PINYON JAY	
B350	CLARK'S NUTCRACKER	
B351	BLACK-BILLED MAGPIE	
B352	YELLOW-BILLED MAGPIE	
B353	AMERICAN CROW	14
B354	COMMON RAVEN	
B337	HORNED LARK	7
B338	PURPLE MARTIN	7
B339	TREE SWALLOW	
B340	VIOLET-GREEN SWALLOW	
B341	NORTHERN ROUGH-WINGED SWALLOW	
B342	BANK SWALLOW	4
B343	CLIFF SWALLOW	
B344	BARN SWALLOW	
B356	MOUNTAIN CHICKADEE	
B357	CHESTNUT-BACKED CHICKADEE	
B358	OAK TITMOUSE	
B552	JUNIPER TITMOUSE	
B360	BUSHTIT	
B361	RED-BREASTED NUTHATCH	
B362	WHITE-BREASTED NUTHATCH	
B363	PYGMY NUTHATCH	
B364	BROWN CREEPER	
B366	ROCK WREN	
B367	CANYON WREN	
B368	BEWICK'S WREN	
B369	HOUSE WREN	
B370	WINTER WREN	
B372	MARSH WREN	
B373	AMERICAN DIPPER	
B375	GOLDEN-CROWNED KINGLET	
B376	RUBY-CROWNED KINGLET	

B377	BLUE-GRAY GNATCATCHER	
B380	WESTERN BLUEBIRD	
B381	MOUNTAIN BLUEBIRD	
B382	TOWNSEND'S SOLITAIRE	
B385	SWAINSON'S THRUSH	
B386	HERMIT THRUSH	
B389	AMERICAN ROBIN	
B390	VARIED THRUSH	
B391	WRENTIT	
B393	NORTHERN MOCKINGBIRD	
B398	CALIFORNIA THRASHER	2
B411	EUROPEAN STARLING	
B404	AMERICAN PIPIT	
B407	CEDAR WAXWING	
B408	PHAINOPEPLA	
B425	ORANGE-CROWNED WARBLER	
B426	NASHVILLE WARBLER	
B430	YELLOW WARBLER	7
B435	YELLOW-RUMPED WARBLER	
B436	BLACK-THROATED GRAY WARBLER	
B437	TOWNSEND'S WARBLER	
B438	HERMIT WARBLER	
B773	AMERICAN REDSTART	
B460	MACGILLIVRAY'S WARBLER	
B461	COMMON YELLOWTHROAT	7
B463	WILSON'S WARBLER	
B467	YELLOW-BREASTED CHAT	7
B471	WESTERN TANAGER	
B482	GREEN-TAILED TOWHEE	
B483	SPOTTED TOWHEE	7
B484	CALIFORNIA TOWHEE	2, 3
B487	RUFIOUS-CROWNED SPARROW	7
B489	CHIPPING SPARROW	
B491	BREWER'S SPARROW	
B493	BLACK-CHINNED SPARROW	
B494	VESPER SPARROW	
B495	LARK SPARROW	
B497	SAGE SPARROW	2, 7
B499	SAVANNAH SPARROW	3, 7
B501	GRASSHOPPER SPARROW	
B504	FOX SPARROW	
B505	SONG SPARROW	7
B506	LINCOLN'S SPARROW	
B798	WHITE-THROATED SPARROW	
B799	HARRIS'S SPARROW	
B510	WHITE-CROWNED SPARROW	
B509	GOLDEN-CROWNED SPARROW	
B512	DARK-EYED JUNCO	7
B475	BLACK-HEADED GROSBEAK	

B476	BLUE GROSBEAK	
B477	LAZULI BUNTING	
B809	INDIGO BUNTING	
B519	RED-WINGED BLACKBIRD	
B520	TRICOLORED BLACKBIRD	7
B521	WESTERN MEADOWLARK	
B522	YELLOW-HEADED BLACKBIRD	
B524	BREWER'S BLACKBIRD	
B528	BROWN-HEADED COWBIRD	
B530	HOODED ORIOLE	
B532	BULLOCK'S ORIOLE	
B534	GRAY-CROWNED ROSY-FINCH	
B535	PINE GROSBEAK	
B536	PURPLE FINCH	
B537	CASSIN'S FINCH	
B538	HOUSE FINCH	
B539	RED CROSSBILL	
B542	PINE SISKIN	
B543	LESSER GOLDFINCH	
B544	LAWRENCE'S GOLDFINCH	
B545	AMERICAN GOLDFINCH	
B546	EVENING GROSBEAK	
B547	HOUSE SPARROW	
M001	VIRGINIA OPOSSUM	14
M003	VAGRANT SHREW	7
M004	DUSKY SHREW	
M006	ORNATE SHREW	7, 10
M010	WATER SHREW	
M012	TROWBRIDGE'S SHREW	
M018	BROAD-FOOTED MOLE	7
M021	LITTLE BROWN MYOTIS	7
M023	YUMA MYOTIS	7
M025	LONG-EARED MYOTIS	
M026	FRINGED MYOTIS	
M027	LONG-LEGGED MYOTIS	
M028	CALIFORNIA MYOTIS	
M029	WESTERN SMALL-FOOTED MYOTIS	
M030	SILVER-HAIRED BAT	
M031	WESTERN PIPISTRELLE	
M032	BIG BROWN BAT	
M033	WESTERN RED BAT	12
M034	HOARY BAT	
M036	SPOTTED BAT	7
M037	TOWNSEND'S BIG-EARED BAT	7, 12
M038	PALLID BAT	7, 12
M039	BRAZILIAN FREE-TAILED BAT	
M042	WESTERN MASTIFF BAT	7
M043	AMERICAN PIKA	
M045	BRUSH RABBIT	3, 8, 14

M046	MOUNTAIN COTTONTAIL	14
M047	DESERT COTTONTAIL	14
M049	SNOWSHOE HARE	7, 14
M050	WHITE-TAILED JACKRABBIT	7, 14
M051	BLACK-TAILED JACKRABBIT	7, 14
M052	MOUNTAIN BEAVER	1, 7
M055	YELLOW-PINE CHIPMUNK	
M062	LONG-EARED CHIPMUNK	
M057	ALLEN'S CHIPMUNK	
M063	LODGEPOLE CHIPMUNK	12
M066	YELLOW-BELLIED MARMOT	
M070	BELDING'S GROUND SQUIRREL	
M072	CALIFORNIA GROUND SQUIRREL	
M075	GOLDEN-MANTLED GROUND SQUIRREL	
M076	EASTERN GRAY SQUIRREL	14
M077	WESTERN GRAY SQUIRREL	14
M078	EASTERN FOX SQUIRREL	14
M079	DOUGLAS' SQUIRREL	14
M080	NORTHERN FLYING SQUIRREL	7, 12
M081	BOTTA'S POCKET GOPHER	
M083	NORTHERN POCKET GOPHER	
M085	MOUNTAIN POCKET GOPHER	
M087	SAN JOAQUIN POCKET MOUSE	7
M095	CALIFORNIA POCKET MOUSE	7
M104	HEERMANN'S KANGAROO RAT	1, 3, 5
M105	CALIFORNIA KANGAROO RAT	7
M112	AMERICAN BEAVER	14
M113	WESTERN HARVEST MOUSE	
M114	SALT-MARSH HARVEST MOUSE	1, 3, 5
M117	DEER MOUSE	7
M118	CANYON MOUSE	
M119	BRUSH MOUSE	
M120	PINON MOUSE	
M127	DUSKY-FOOTED WOODRAT	7, 10
M128	BUSHY-TAILED WOODRAT	
M140	BLACK RAT	
M141	NORWAY RAT	
M142	HOUSE MOUSE	
M130	HEATHER VOLE	
M133	MONTANE VOLE	
M134	CALIFORNIA VOLE	1, 3, 7
M136	LONG-TAILED VOLE	
M139	COMMON MUSKRAT	14
M143	WESTERN JUMPING MOUSE	
M145	COMMON PORCUPINE	
M146	COYOTE	14
M147	RED FOX	4, 12, 14
M149	GRAY FOX	14
M151	BLACK BEAR	14

M152	RINGTAIL	5
M153	RACCOON	14
M154	AMERICAN MARTEN	7, 12
M155	FISHER	7, 12
M156	ERMINE	14
M157	LONG-TAILED WEASEL	14
M158	AMERICAN MINK	14
M159	WOLVERINE	4, 5, 12
M160	AMERICAN BADGER	14
M163	NORTHERN RIVER OTTER	7
M161	WESTERN SPOTTED SKUNK	7, 14
M162	STRIPED SKUNK	14
M165	MOUNTAIN LION	5, 7
M166	BOBCAT	14
M181	MULE DEER	14
M186	FERAL GOAT	14

Total Number of Species: 407

California National Diversity Database for Cosumnes River Watershed Project

The following table is a summary of the element occurrence points that occur within the Cosumnes River Watershed boundaries. This data was created from the California Natural Diversity Database, and imported into ArcView for analysis. The points were “clipped” to the shape of the watershed, so that only those points that occur within the boundary are included. A summary table was then produced providing a count of the number of occurrences of each species.

It is presented three ways: by alphabetical by common name, alphabetical by scientific name, and descending order number of observation occurrences.

The California Natural Diversity Database lists only those species that have a record of observation in the watershed.

TABLE 7: CALIFORNIA NATIONAL DIVERSITY DATABASE RESULTS - ALPHABETICAL BY COMMON NAME

COMMON NAME	SCIENTIFIC NAME	COUNT
BALD EAGLE	<i>Haliaeetus leucocephalus</i>	1
BANK SWALLOW	<i>Riparia riparia</i>	2
BISBEE PEAK RUSH-ROSE	<i>Helianthemum suffrutescens</i>	12
CALIFORNIA LINDERIELLA	<i>Linderiella occidentalis</i>	7
CALIFORNIA TIGER SALAMANDER	<i>Ambystoma californiense</i>	4
CENTRAL VALLEY DRAINAGE HARDHEAD/SQUAWFISH STREAM	<i>Central valley drainage hardhead/squawfish stream</i>	1
CENTRAL VALLEY DRAINAGE RESIDENT RAINBOW TROUT STREAM	<i>Central valley drainage resident rainbow trout stream</i>	3
CENTRAL VALLEY DRAINAGE SPRING STREAM	<i>Central valley drainage spring stream</i>	2
DWARF DOWNINGIA	<i>Downingia pusilla</i>	1
EL DORADO BEDSTRAW	<i>Galium californicum ssp sierrae</i>	2
EL DORADO COUNTY MULE EARS	<i>Wyethia reticulata</i>	10
FOOTHILL YELLOW-LEGGED FROG	<i>Rana boylei</i>	6
GIANT GARTER SNAKE	<i>Thamnophis gigas</i>	3
GOLDEN EAGLE	<i>Aquila chrysaetos</i>	1
GREAT BLUE HERON	<i>Ardea herodias</i>	1
GREAT EGRET	<i>Ardea alba</i>	1
GREAT VALLEY MIXED RIPARIAN FOREST	<i>Great valley mixed riparian forest</i>	1
GREAT VALLEY VALLEY OAK RIPARIAN FOREST	<i>Great valley valley oak riparian forest</i>	2
IONE BUCKWHEAT	<i>Eriogonum apricum var apricum</i>	1
IONE CHAPARRAL	<i>Ione chaparral</i>	4
IONE MANZANITA	<i>Arctostaphylos myrtifolia</i>	5
IRISH HILL BUCKWHEAT	<i>Eriogonum apricum var prostratum</i>	2
LAYNE'S RAGWORT	<i>Senecio layneae</i>	17
LEGENERE	<i>Legenere limosa</i>	4
MOUNTAIN YELLOW-LEGGED FROG	<i>Rana muscosa</i>	4
NISSANAN MANZANITA	<i>Arctostaphylos nissenana</i>	2
NORTHERN GOSHAWK	<i>Accipiter gentilis</i>	2
NORTHERN HARDPAN VERNAL POOL	<i>Northern hardpan vernal pool</i>	35
NORTHWESTERN POND TURTLE	<i>Clemmys marmorata marmorata</i>	4
PARRY'S HORKELIA	<i>Horkelia parryi</i>	4
PINCUSHION NAVARRETIA	<i>Navarretia myersii ssp myersii</i>	1
PINE HILL CEANOTHUS	<i>Ceanothus roderickii</i>	8
PLEASANT VALLEY MARIPOSA LILY	<i>Calochortus clavatus var avius</i>	58
RED HILLS SOAPROOT	<i>Chlorogalum grandiflorum</i>	5
SACRAMENTO ORCUTT GRASS	<i>Orcuttia viscida</i>	1
SACRAMENTO-SAN JOAQUIN FOOTHILL/VALLEY EPHEMERAL STREAM	<i>Sacramento-San joaquin foothill/valley ephemeral stream</i>	1
SANFORD'S ARROWHEAD	<i>Sagittaria sanfordii</i>	3
STEBBINS'S MORNING-GLORY	<i>Calystegia stebbinsii</i>	7
SWAINSON'S HAWK	<i>Buteo swainsoni</i>	54
TRICOLORED BLACKBIRD	<i>Agelaius tricolor</i>	50
VALLEY ELDERBERRY LONGHORN BEETLE	<i>Desmocerus californicus dimorphus</i>	5
VALLEY OAK WOODLAND	<i>Valley oak woodland</i>	1

VERNAL POOL FAIRY SHRIMP	<i>Branchinecta lynchi</i>	11
VERNAL POOL TADPOLE SHRIMP	<i>Lepidurus packardii</i>	7
WESTERN SPADEFOOT	<i>Scaphiopus hammondi</i>	1
WHITE-TAILED KITE	<i>Elanus leucurus</i>	3

The California Natural Diversity Database shows 46 species of plants and animals occurring (meaning they have been observed) within the Cosumnes River watershed boundaries. The counts indicate the number of occurrences of this species in the watershed, and may reflect the relative abundance of a species, or more likely, simply that it has been observed more often, perhaps because it is easy to observe. On the watershed map, most of the observations occur in the lower portion of the watershed, probably not a reflection of biological ranges, but of where more observational research has been done.

The complete list of State and Federally listed species for California can be found at the California Department of Fish and Game Wildlife and Habitat Data Analysis Branch (also the providers of the California Natural Diversity Database and California Wildlife Habitat Relationship) at <http://www.dfg.ca.gov/whdab/html/lists.html>. The U.S. Fish and Wildlife species list for California can be found at <http://endangered.fws.gov/wildlife.html>.

INFORMATION GAPS

Information on biological habitats and wildlife species specific to the boundaries of the Cosumnes River Watershed is lacking. These will require a more detailed field analysis, review of past and current studies, and coordination with other partners in Phase II or III.

The next version of the California Wildlife Habitat Relationship (Version 8) is supposed to have a GIS component that would allow us to select only the species predicted to occur within the Watershed Boundary. This would make a more precise, if not accurate, list.

The California Natural Diversity Database includes only those species of special concern that have actually been observed. However, it is wise to consider plant and animal species that may occur in surrounding areas that might travel to the Watershed if conditions were right. Given the right habitat and opportunity, some of the more mobile species might well occur within the watershed. Simply because a species has not been observed does not mean it is not there.

If a formal Environmental Assessment is needed, a request will need to be sent to the U.S. Fish and Wildlife Service requesting a list for individual quadrangles.

PRESENCE OF FISH IN THE COSUMNES RIVER AS IDENTIFIED BY THE COSUMNES RIVER PRESERVE

TABLE 8: FISH OF THE COSUMNES RIVER

Whitener, Keith, 2002. Cosumnes River Fish Species List – (Updated-1/02)

SPECIES	PRESENCE	ORIGIN
AMERICAN SHAD (<i>Alosa sapidissima</i>)	Verified	Introduced
BIGSCALE LOGPERCH (<i>Percina caprodes</i>)	Verified	Introduced
BLACK BULLHEAD (<i>Ictalurus melas</i>)	Verified	Introduced
BLUEGILL (<i>Lepomis macrochirus</i>)	Verified	Introduced
BROOK TROUT (<i>Salvelinus fontinalis</i>)	Assumed	Introduced
BROWN BULLHEAD (<i>Ameiurus nebulosus</i>)	Verified	Introduced
BROWN TROUT (<i>Salmo trutta</i>)	Assumed	Introduced
CALIFORNIA ROACH (<i>Lavinia symmetricus</i>)	Assumed	Native
CARP (<i>Cyprinus carpio</i>)	Verified	Introduced
CHANNEL CATFISH (<i>Ictalurus punctatus</i>)	Verified	Introduced
CHINOOK SALMON (<i>Oncorhynchus tshawytscha</i>)	Verified	Native
CRAPPIE (black) (<i>Pomoxis nigromaculatus</i>)	Verified	Introduced
FATHEAD MINNOW (<i>Pimephales promelas</i>)	Verified	Introduced
GOLDEN SHINER (<i>Notemigonus crysoleucas</i>)	Verified	Introduced
GOLDFISH (<i>Carassius auratus</i>)	Verified	Introduced
GREEN SUNFISH (<i>Lepomis cyanellus</i>)	Verified	Introduced
HARDHEAD (<i>Mylopharodon conocephalus</i>)	Likely extirpated	Native
HITCH (<i>Lavinia exilicauda</i>)	Verified	Native
INLAND SILVERSIDE (<i>Menidia beryllina</i>)	Verified	Introduced
LARGEMOUTH BASS (<i>Micropterus salmoides</i>)	Verified	Introduced
WESTERN MOSQUITOFISH (<i>Gambusia affinis</i>)	Verified	Introduced
PACIFIC LAMPREY (<i>Lampetra tridentata</i>)	Verified	Native
PRICKLY SCULPIN (<i>Cottus asper</i>)	Verified	Native
RAINBOW TROUT (<i>Oncorhynchus mykiss</i>)	Assumed	Native
REDEAR SUNFISH (<i>Lepomis microlophus</i>)	Verified	Introduced
SACRAMENTO PIKEMINNOW (<i>Ptychocheilus grandis</i>)	Verified	Native
SACRAMENTO SUCKER (<i>Catostomus occidentalis</i>)	Verified	Native
SMALLMOUTH BASS (<i>Micropterus dolomieu</i>)	Verified	Introduced
SPLITTAIL (<i>Pogonichthys macrolepidotus</i>)	Verified	Native
SPOTTED BASS (<i>Micropterus punctulatus</i>)	Verified	Introduced
STRIPED BASS (<i>Morone saxatilis</i>)	Verified	Introduced
THREADFIN SHAD (<i>Dorosoma petenense</i>)	Verified	Introduced
TULE PERCH (<i>Hysteroecarpus traski</i>)	Verified	Native
WAGASAKI (<i>Hypomesus nipponensis</i>)	Verified	Introduced
WARMOUTH (<i>Lepomis gulosus</i>)	Verified	Introduced
WHITE CATFISH (<i>Ameiurus catus</i>)	Verified	Introduced

REFERENCES

California Department of Fish and Game, 1999. California Habitat Wildlife Relationships version 7.0. USDA-Natural Resources Conservation Service State Office.

California Department of Fish and Game, 2000. California Natural Diversity Database.

U.S. Fish and Wildlife, 2000. California Species List <<http://endangered.fws.gov/wildlife.html>>

Whitener, Keith, 2002. Cosumnes River Fish Species List – (Updated-1/02). The Nature Conservancy.

CHAPTER 11: CULTURAL RESOURCES

ARCHEOLOGICAL BACKGROUND

In the early 1930s archeological work started to focus on the Cosumnes River. Sacramento Junior College conducted some of these early studies. Excavations, especially at the Windmill Mound, CA-SAC-107, suggested three distinct cultural traditions: early, transitional and late. Many more investigations of the Cosumnes River Watershed were to follow. A few of the results are summarized below.

Two sites occur near State Highway 16 Cosumnes River crossing, CA-SAC-51 and CA-SAC-163. The first, CA-SAC-51 was recorded in 1949 and includes some bedrock mortars and possible midden. The second, CA-SAC-163 was recorded in 1950 (updated in 1968) and includes twenty-one bedrock mortars. Within one-half mile of this site are thirteen prehistoric sites that specifically mention observed or possible midden deposits. One previously recorded historic archeological site located in this area, Murieta Recreation Area, was recorded by Charles Slaymaker and included trees, fence lines, remnants of a gate, a possible pump house and a few historic artifacts and a rock structure dating to 1855-1860 (Department of Anthropology, 2000).

Excavation in the 1960s and 1970s resulted in many burials and burial offerings. Structure remains and artifacts as well as floral and faunal materials, CA-SAC-267. This site was placed at A.D. 500 and 1840 (late horizon), based on obsidian hydration, radiocarbon dating and cross dating (Waechter, Sharon A., Midesell, Steven D., 1994).

In 1991, archeologist from Far Western Anthropological Research Group, Inc., conducted excavations on CA-SAC-133, located east of Sloughhouse. The site contained many burials, six of which were dated between 1500 and 1100 BC (Waechter, Sharon A., Midesell, Steven D., 1994).

Historic American Buildings Survey/American Engineering Record has three records for the Cosumnes River Watershed located in El Dorado County. (1) CA-1353, House, Nashville, documentation compiled after 1933. (2) CA-1354 Log Barn, Nashville, documentation compiled after 1933. The log barn was built in the 1850s. (3) CA-182, Omo Ranch, PiPi Bridge, Spans the Middle Fork of the Cosumnes River at North South Road.

Historic American Buildings Survey/American Engineering Record has two historical structures on record for the portion of Amador County located within the Cosumnes River Watershed. (1) CA-1351- House in Plymouth, documentation compiled after 1933. (2) Survey number CA-1516- Heath's Store, Michigan Bar, documentation compiled after 1933. Built in the early 1850s when an active community existed. The store was a one-story, wood frame building with channel rustic siding on the front and sidewalls. The store stayed in existence until the late 1930s when some Chinese miners bought the property and demolished what was left of the building to search for gold.

ETHNOLOGICAL BACKGROUND

“Prehistoric peoples first traveled through the Sierra Nevada range more than 10,000 years ago....” Approximately 4,000 years ago the Miwok, Washo and Maidue people came to settle in what is now the Eldorado National Forest to the north and Calaveras River to the south (Eldorado National Forest, 1997 and Indian Grinding Rock About the Park Indian Grinding Rock State Park, 1998).

Villages were established along the rivers and streams. The climate, water supply and abundance of good village sites made these areas a perfect spot to live. The Miwok gathered acorns, caught fish, hunted deer and other game throughout these hills. Commodities that could not be gather or hunted locally were obtained by trading with neighboring tribes.

The Miwok wasted little. To avoid depleting resources, all resources were used with care. This included using all parts of plants and animals. “For example, a plant called soap root was mashed and used not only as soap, but also to stupefy and catch fish. Its leaves were eaten fresh and the bulb could also be baked and eaten. The fibrous leaves could be dried and bundled so it could be used as a brush” (California Baskets, 2002).

The Miwok relied upon acorns as a mainstay of their diet. “Acorns were harvested in autumn, dried and stored in large granaries called cha’ka. These could be eight or more feet high and were made of poles interwoven with slender brush stems. Resembling large baskets, they were lines with pine needles and wormwood, the odor of which repelled insects and rodents. The cha’ka was thatched with short boughs of white fir or of incense cedar to shed snow and rain” (California Baskets, 2002).

Miwok “village size varied from two dozen to as many as several hundred individuals. Each village had a specific territory that belonged to the group. Because this territory encompassed several ecological life zones, the village could be reasonably sure that its need for food, clothing and shelter would be met. Diversity in the environment was important to survival” (California Baskets, 2002).

“Miwok homes ranged from eight to fifteen feet in diameter and were built of cedar poles interwoven with grapevines or willow and covered with cedar bark. A hole was left at the top for smoke from cooking or heating fires.” (Indian Grinding Rock About the Park Indian Grinding Rock State Park, 1998).

In the late 1840s settlers began moving west. Michigan Bar, along the Cosumnes River in Sacramento County became a prominent gold mining camp. By the early 1950s the camp reached a population of 1,500 or more. Michigan Bar and other nearby towns, Katesville near Cooks Bar and Live Oak near Sebastopol, once lively mining towns with saloons, hotels and boarding houses were abandon in the early 1960s as gold rush fever came to an end.

Several roads passed through the Cosumnes River region and ferries, succeeded by toll bridges, as well as hotels were established. William Daylor and Jared Sheldon, as owners of the

Omochochumne Mexican grant, were strategically situated to make great profits from ranching, trading and hotel keeping. In 1850 Sheldon built the Slough House on Deer Creek, just west of the Cosumnes River. Fire destroyed the hotel in 1890 and it was rebuilt that same year. Today Sloughhouse is a thriving restaurant.

Daylor was also a hotelkeeper and a trader. He owned a hotel just east of Slough House on the Cosumnes known as Daylor Ranch and later as the Cosumnes post office.

In 1846-1947 Sheldon built a gristmill on Rancho Omochochumnes. In 1851 he built a dam to provide water to operate the mill. As a result of the dam miners camps were flooded. This great controversy led to Sheldon's demise as he and two of his men were killed in a battle with the miners. The dam was swept away by high waters in 1851-1852 (Hoover, et al., 1990).

Downstream, where the Cosumnes now flows under Highway 99, was the ranch of Martin Murphy, Jr. A skirmish with soldiers of the Mexican army, set off events that led to the Bear Flag Revolt at Sonoma and the subsequent American conquest of California (Hoover, et al., 1990).

Natural Resources Conservation Service Applicability and Exceptions

This study is Phase 1 of the Resources Inventory of the Cosumnes River Watershed. Treatment measures have not been identified or planned to improve or protect any of the resources. Natural Resources Conservation Service technical assistance which does not result in any change to cultural resources or is provided as information at the request of landowners is not considered and undertaking as defined in the Programmatic Agreement (PA) between the Advisory Council on Historic Preservation and the National Council of State Historic Preservation Officers. This includes Natural Resources Conservation Service activities that are considered forms of non-intrusive data collections such as the Cosumnes River Watershed Resources Inventory.

Project Implementation - Lead Agency Responsibilities

Natural Resources Conservation Service

The Natural Resources Conservation Service is responsible for cultural resources compliance in all actions where the Natural Resources Conservation Service is considered the lead agency. Natural Resources Conservation Service lead activities would include when Natural Resources Conservation Service has been given the legislated responsibility or designated departmental authority to administer specific Federal programs, or when providing to nonfederal participants, direct, single agency actions of technical and/or financial assistance that may affect cultural resources.

In these situations, Natural Resources Conservation Service will fulfill its National Historic Preservation Act Section 106 requirements in accordance with its Programmatic Agreement (PA) by:

- a. Determining if the proposed activity is considered an undertaking by PA's.
- b. Conducting a cultural resources review by contacting the appropriate Information Center of the California Historical Resources File System and requesting information on known resources and surveys in the area of the proposed activity; and
- c. Conducting a site visit to the location and completing a field inspection of the area to relocate previously known cultural resources and/or possibly locate new cultural resources.

Other Federal Agencies

Other federal agencies involved in a proposed project or activity are responsible for initiating and completing the federal review process designed to ensure that historic properties are considered during federal project planning and execution (Section 106 process).

State Agencies

- a. Resource Conservation Districts and Other State Agencies:

The California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 et seq.) requires that lead agencies must identify and examine the significant adverse environmental effects from a project before approving it.

When a project may adversely affect a unique archeological resource, Section 21083.2 of CEQA requires the lead agency to treat that effect as a significant environmental effect. If an archeological resource is listed in or eligible to be listed in the California Register of Historical Resources, Section 21084.1 of CEQA requires that any substantial adverse effect to that resource be considered a significant environmental effect. In both cases an environmental impact report (EIR) must be prepared.

Private Individuals

The state legislature recognizes the preservation and enhancement of historical properties is largely based on the good will and cooperation of the general public along with the owners of historic resources. California Public Resources Code, Government Code, Health and Safety Code, and Penal Code contain numerous references to the preservation and enhancement of historical resources.

At the very minimum, the destruction or defacement of any object or thing of archeological or historical value, whether on public or private lands, is in violation of the penal code.

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APPENDIX A - AVAILABLE MAPS

GEOGRAPHIC DATA

TABLE 9: U.S. GEOLOGICAL SURVEY 1:250,000 7.5 MINUTE QUADRANGLES FOR COSUMNES RIVER WATERSHED

MAP INDEX NUMBER	QUAD NUMBER	QUAD NAME
38121		Sacramento
38120		El Dorado

TABLE 10: U.S. GEOLOGICAL SURVEY 1:100,000 7.5 MINUTE QUADRANGLES FOR COSUMNES RIVER WATERSHED

MAP INDEX NUMBER	QUAD NUMBER	QUAD NAME
38121-E1		Sacramento
38121-A1		Lodi
38120-E1		Placerville
38120-A1		San Andreas

TABLE 11: U.S. GEOLOGICAL SURVEY 1:24,000 7.5 MINUTE QUADRANGLES FOR COSUMNES RIVER WATERSHED

MAP INDEX NUMBER	QUAD NUMBER	QUAD NAME
38121	B5	Isleton
38121	B4	Thornton
38121	B3	Lodi North
38121	C5	Courtland
38121	C4	Bruceville
38121	C3	Galt
38121	C2	Clay
38121	C1	Goose Creek
38121	D3	Elk Grove
38121	D2	Sloughhouse
38121	D1	Carbondale
38121	E2	Buffalo Creek
38121	E1	Folsom SE
38121	F1	Clarksville
38120	C8	Ione
38120	D8	Irish Hill
38120	D7	Amador City
38120	D5	West Point
38120	E8	Latrobe
38120	E7	Fiddletown
38120	E6	Aukum
38120	E5	Omo Ranch
38120	E4	Caldor
38120	E3	Peddler Hill
38120	E2	Bear River Reservoir
38120	F8	Shingle Springs
38120	F7	Placerville
38120	F6	Camino
38120	F5	Sly Park

38120	F4	Stump Spring
38120	F3	Leek Spring Hill
38120	F2	Tragedy Spring
38120	G5	Pollock Pines
38120	G4	Riverton

FIGURE 10 QUAD INDEX MAP

GIS DIGITAL MAP DATABASE

Natural Resources Conservation Service State Office, Davis
PC ArcView 3.2 with Spatial Analyst

Maps produced to date:

- Watershed Boundary (Figure 2)
- Basins or sub-watersheds
- Watershed boundary with Shaded Relief
- Watershed with Counties
- Watershed with CalWater 2.2 Sub-watershed -detail

These print maps were created using available GIS coverage data:

- California Shaded Relief (University California, Davis ICE) CalWater 2.0 (Teale data center)
- CalWater 2.2 (Teale data center)
- County Boundaries (Natural Resources Conservation Service)
- Digital Raster Graphics (DRG) of U.S. Geological Survey quads (1:24,000, 1:250,000) Government Ownership (Teale data center)
- Hydrography (polygon) (Teale data center) Hydrologic Units (Teale data center)
- Major and Minor Roads (Teale data center) Place Names (Teale data center)
- Rivers and Streams (Teale data center)
- Watershed Boundaries (Compiled from University California, Davis ICE)

All data coverages are in the Albers Equal Area projection (with the "Teale Shift"), NAD 27. This is the "standard" for statewide data. To use with local digital data sets (such as DEMs and U.S. Geological Survey 7.5-minute quadrangles) the data must be reprojected using ArcInfo into UTM Zone 10, NAD 83.

Natural Resources Conservation Service State Office, Placerville
PC ArcView 3.2 with Spatial Analyst

Maps produced to date:

- Location Map (figure 1)
- Soil Surface Texture (figure 3)
- Soil Erodibility Factors - Kf (figure 4)
- Soil Erodibility Factors - Kw (figure 5)
- Hydrologic Groups (figure 6)
- Flooding Frequency (figure 7)
- Non-Irrigated Capability Class (figure 8)
- Irrigated Capability Class (figure 9)

Maps (figure 3-9) were compiled from USDA / NRCS SSURGO soils data 1998 for Sacramento County.

ADDITIONAL MAPS ARE AVAILABLE AT THE FOLLOWING LOCATION

Amador County, Natural Resources Conservation Service Office, Jackson

- Soils Maps
STATSGO digital soils mapping covers the entire watershed and will be included as map products in the Soils Report. Amador is not scheduled for SSURGO digital soil maps.
- Erosion Map 1:100,000
Sheet & Rill, Wind Erosion, Urban/Roadside/Construction Site, Streambank, Gully Erosion
- Aerial Photographs
1944: covers Amador County up to Eldorado National Forest, some photos missing; 1960 and 1970: covers Amador County up to Eldorado National Forest, 1981 and 1993: covers all Amador County.
- Amador County Important Farmlands 2000 - 1:100,000.
Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Urban & Built-up Land.
- Geology Maps
Natural Resources Conservation Service has 1:250,000-scale geology maps for the entire state of California

El Dorado County, Natural Resources Conservation Service Center, Placerville

- Soil Maps
STATSGO and SSURGO (2001) digital soil maps are available for Western El Dorado County.
- Erosion Map 1:100,000
Sheet & Rill, Wind Erosion, Urban/Roadside/Construction site, Streambank, Gully Erosion
- Aerial Photographs
1952, 1971, 1978, 1984, 1993 is digital ortho-imagery and some SPOT satellite imagery 1993 - 10 meter PAN.
- Important Farmland 1998 – 1:100,000 (West-El Dorado County)
Prime farmland, Farmland of statewide importance, Unique farmland, Farmland of local importance, Urban & Built-up Land.
- Geology Maps
Natural Resources Conservation Service has 1:250,000-scale geology maps for the entire

state of California.

Sacramento County, Natural Resources Conservation Service Center, Elk Grove

- Soil Maps 1:24,000
STATSGO digital soils mapping covers the entire watershed and will be included as map products in the Soils Report. Digital soils map in SSURGO are currently available for Sacramento County. SSURGO soils data has been extensively downloaded and integrated with GIS and detailed soil reports for Sacramento County.
- Erosion Map 1:100,000
Erosion Map including Sheet & Rill, Wind Erosion, Urban/Roadside/Construction site, Streambank, and Gully Erosion are available for 1982.
- Aerial Photographs
Contact aerials are available for 1937 (1:7,920), 1957 (1:7,920), 1964 (1:7,920), 1974 (1:14,400), 1983 (1:12,000), 1984 (1:12,000) and 1993 mylars (1:12,000). Aerial photographs for 1993 are also available in digital format.
- Important Farmland 1998 – 1:100,000
Prime farmland, Farmland of statewide importance, Unique farmland, Farmland of local importance, Urban & built up land.
- Geology Maps
Natural Resources Conservation Service office has 1:250,000-scale geology maps for the entire state of California

Eldorado National Forest Service, Placerville

- Road Map
Eldorado National Forest has a forest map that shows our major road systems on it. They are in the process of finishing an update roads layer. The Forest will be starting a road analysis process within the next year.

APPENDIX B - BIOLOGICAL DATA

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS SYSTEM – AMADOR

California Wildlife Habitat Relationships System - 11/29/2001. Supported by California Interagency Wildlife Task Group and maintained by the California Department of Fish and Game. Database Version: 7.0. This copy of the Database is licensed to the USDA Natural Resources Conservation Service.

Species Summary Report

This list was compiled with the following Single Condition Query:

Location: Amador

Habitats: none (defaults to all)

Elements to Exclude: none

Available Species: all (default)

Status Selection: none (defaults to all)

Season Selection: none (defaults to all)

STATUS

1=Fed Endangered

2=Fed Threatened

3=Ca Endangered

4=Ca Threatened

5=Ca Fully Protected

6=Ca Protected

7=Ca Species of Special
Concern

8=Fed Prop Endangered

9=Fed Prop Threatened

10=Fed Candidate

11=BLM Sensitive

12=USFS Sensitive

13=CDF Sensitive

14=Harvest

ID	SPECIES NAME	STATUS
A047	TIGER SALAMANDER	
A001	CALIFORNIA TIGER SALAMANDER	6, 7, 10
A003	LONG-TOED SALAMANDER	1, 3, 5, 6
A007	CALIFORNIA NEWT	7
A012	ENSATINA	7, 12
A022	ARBOREAL SALAMANDER	
A014	CALIFORNIA SLENDER SALAMANDER	
A023	MOUNT LYELL SALAMANDER	6, 7
A028	WESTERN SPADEFOOT	6, 7
A032	WESTERN TOAD	
A033	YOSEMITE TOAD	6, 7, 12
A039	PACIFIC CHORUS FROG	
A040	RED-LEGGED FROG	2, 6, 7, 12
A043	FOOTHILL YELLOW-LEGGED FROG	6, 7, 12
A044	MOUNTAIN YELLOW-LEGGED FROG	6, 7, 12
A046	BULLFROG	14

R004	WESTERN POND TURTLE	6, 7, 12
R022	WESTERN FENCE LIZARD	
R023	SAGEBRUSH LIZARD	
R029	COAST HORNED LIZARD	6, 7, 12
R036	WESTERN SKINK	7
R037	GILBERT'S SKINK	
R039	WESTERN WHIPTAIL	
R040	SOUTHERN ALLIGATOR LIZARD	
R042	NORTHERN ALLIGATOR LIZARD	
R046	RUBBER BOA	4, 6, 12
R048	RINGNECK SNAKE	12
R049	SHARP-TAILED SNAKE	
R051	RACER	
R053	STRIPED RACER	2, 4, 6
R057	GOPHER SNAKE	7
R058	COMMON KINGSNAKE	
R059	CALIFORNIA MOUNTAIN KINGSNAKE	6, 7, 12
R060	LONG-NOSED SNAKE	
R061	COMMON GARTER SNAKE	1, 3, 5, 6, 7
R062	WESTERN TERRESTRIAL GARTER SNAKE	
R063	WESTERN AQUATIC GARTER SNAKE	2, 4
R071	NIGHT SNAKE	
R076	WESTERN RATTLESNAKE	
B006	PIED-BILLED GREBE	
B007	HORNED GREBE	
B009	EARED GREBE	
B010	WESTERN GREBE	
B548	CLARK'S GREBE	
B042	AMERICAN WHITE PELICAN	7
B044	DOUBLE-CRESTED CORMORANT	7
B049	AMERICAN BITTERN	
B051	GREAT BLUE HERON	13
B052	GREAT EGRET	13
B053	SNOWY EGRET	
B057	CATTLE EGRET	
B058	GREEN HERON	
B059	BLACK-CROWNED NIGHT HERON	
B108	TURKEY VULTURE	
B075	CANADA GOOSE	2, 14
B067	TUNDRA SWAN	
B076	WOOD DUCK	14
B085	GADWALL	14
B086	EURASIAN WIGEON	14
B087	AMERICAN WIGEON	14
B079	MALLARD	14
B084	NORTHERN SHOVELER	14
B080	NORTHERN PINTAIL	14
B077	GREEN-WINGED TEAL	14
B089	CANVASBACK	14

B090	REDHEAD	14
B091	RING-NECKED DUCK	14
B094	LESSER SCAUP	14
B096	HARLEQUIN DUCK	7, 14
B103	BUFFLEHEAD	14
B101	COMMON GOLDENEYE	14
B104	HOODED MERGANSER	14
B105	COMMON MERGANSER	14
B107	RUDDY DUCK	14
B110	OSPREY	7, 13
B111	WHITE-TAILED KITE	5
B113	BALD EAGLE	2, 3, 5, 13
B114	NORTHERN HARRIER	7
B115	SHARP-SHINNED HAWK	7
B116	COOPER'S HAWK	7
B117	NORTHERN GOSHAWK	7, 12, 13
B119	RED-SHOULDERED HAWK	
B121	SWAINSON'S HAWK	4, 12
B123	RED-TAILED HAWK	
B124	FERRUGINOUS HAWK	7
B125	ROUGH-LEGGED HAWK	
B126	GOLDEN EAGLE	5, 7, 13
B127	AMERICAN KESTREL	
B128	MERLIN	7
B129	PEREGRINE FALCON	1, 3, 5, 13
B131	PRAIRIE FALCON	7
B133	RING-NECKED PHEASANT	14
B134	BLUE GROUSE	14
B138	WILD TURKEY	14
B141	MOUNTAIN QUAIL	14
B140	CALIFORNIA QUAIL	14
B145	VIRGINIA RAIL	
B146	SORA	
B148	COMMON MOORHEN	14
B149	AMERICAN COOT	14
B158	KILLDEER	
B159	MOUNTAIN PLOVER	7, 10
B164	AMERICAN AVOCET	
B165	GREATER YELLOWLEGS	
B170	SPOTTED SANDPIPER	
B173	LONG-BILLED CURLEW	7
B183	WESTERN SANDPIPER	
B185	LEAST SANDPIPER	
B648	BAIRD'S SANDPIPER	7
B649	PECTORAL SANDPIPER	
B191	DUNLIN	
B197	LONG-BILLED DOWITCHER	
B199	COMMON SNIPE	14
B200	WILSON'S PHALAROPE	

B214	RING-BILLED GULL	
B215	CALIFORNIA GULL	7
B216	HERRING GULL	
B221	GLAUCOUS-WINGED GULL	
B250	ROCK DOVE	
B251	BAND-TAILED PIGEON	14
B255	MOURNING DOVE	14
B260	GREATER ROADRUNNER	
B262	BARN OWL	
B263	FLAMMULATED OWL	
B264	WESTERN SCREECH OWL	
B265	GREAT HORNED OWL	
B267	NORTHERN PYGMY OWL	
B269	BURROWING OWL	7
B270	SPOTTED OWL	2, 7, 11, 12, 13
B271	GREAT GRAY OWL	3, 12, 13
B272	LONG-EARED OWL	7
B273	SHORT-EARED OWL	7
B274	NORTHERN SAW-WHET OWL	
B275	LESSER NIGHTHAWK	
B276	COMMON NIGHTHAWK	
B277	COMMON POORWILL	
B281	VAUX'S SWIFT	7
B282	WHITE-THROATED SWIFT	
B286	BLACK-CHINNED HUMMINGBIRD	
B287	ANNA'S HUMMINGBIRD	
B289	CALLIOPE HUMMINGBIRD	
B291	RUFIOUS HUMMINGBIRD	
B293	BELTED KINGFISHER	
B294	LEWIS' WOODPECKER	
B296	ACORN WOODPECKER	
B300	WILLIAMSON'S SAPSUCKER	
B299	RED-BREASTED SAPSUCKER	
B302	NUTTALL'S WOODPECKER	
B303	DOWNY WOODPECKER	
B304	HAIRY WOODPECKER	
B305	WHITE-HEADED WOODPECKER	
B306	BLACK-BACKED WOODPECKER	
B307	NORTHERN FLICKER	3
B308	PILEATED WOODPECKER	
B309	OLIVE-SIDED FLYCATCHER	
B311	WESTERN WOOD-PEWEE	
B315	WILLOW FLYCATCHER	1, 3, 12
B317	HAMMOND'S FLYCATCHER	
B318	DUSKY FLYCATCHER	
B320	PACIFIC-SLOPE FLYCATCHER	
B321	BLACK PHOEBE	
B323	SAY'S PHOEBE	
B326	ASH-THROATED FLYCATCHER	

B333	WESTERN KINGBIRD	
B410	LOGGERHEAD SHRIKE	1, 7
B554	PLUMBEOUS VIREO	
B415	CASSIN'S VIREO	
B417	HUTTON'S VIREO	
B418	WARBLING VIREO	
B346	STELLER'S JAY	
B348	WESTERN SCRUB-JAY	7
B350	CLARK'S NUTCRACKER	
B352	YELLOW-BILLED MAGPIE	
B353	AMERICAN CROW	14
B354	COMMON RAVEN	
B337	HORNED LARK	7
B338	PURPLE MARTIN	7
B339	TREE SWALLOW	
B340	VIOLET-GREEN SWALLOW	
B341	NORTHERN ROUGH-WINGED SWALLOW	
B342	BANK SWALLOW	4
B343	CLIFF SWALLOW	
B344	BARN SWALLOW	
B356	MOUNTAIN CHICKADEE	
B357	CHESTNUT-BACKED CHICKADEE	
B358	OAK TITMOUSE	
B360	BUSHTIT	
B361	RED-BREASTED NUTHATCH	
B362	WHITE-BREASTED NUTHATCH	
B363	PYGMY NUTHATCH	
B364	BROWN CREEPER	
B366	ROCK WREN	
B367	CANYON WREN	
B368	BEWICK'S WREN	
B369	HOUSE WREN	
B370	WINTER WREN	
B372	MARSH WREN	
B373	AMERICAN DIPPER	
B375	GOLDEN-CROWNED KINGLET	
B376	RUBY-CROWNED KINGLET	
B377	BLUE-GRAY GNATCATCHER	
B380	WESTERN BLUEBIRD	
B381	MOUNTAIN BLUEBIRD	
B382	TOWNSEND'S SOLITAIRE	
B385	SWAINSON'S THRUSH	
B386	HERMIT THRUSH	
B389	AMERICAN ROBIN	
B390	VARIED THRUSH	
B391	WRENTIT	
B393	NORTHERN MOCKINGBIRD	
B398	CALIFORNIA THRASHER	2
B411	EUROPEAN STARLING	

B404	AMERICAN PIPIT	
B407	CEDAR WAXWING	
B408	PHAINOPEPLA	
B425	ORANGE-CROWNED WARBLER	
B426	NASHVILLE WARBLER	
B430	YELLOW WARBLER	7
B435	YELLOW-RUMPED WARBLER	
B436	BLACK-THROATED GRAY WARBLER	
B438	HERMIT WARBLER	
B460	MACGILLIVRAY'S WARBLER	
B461	COMMON YELLOWTHROAT	7
B463	WILSON'S WARBLER	
B467	YELLOW-BREASTED CHAT	7
B471	WESTERN TANAGER	
B482	GREEN-TAILED TOWHEE	
B483	SPOTTED TOWHEE	7
B484	CALIFORNIA TOWHEE	2, 3
B487	RUFIOUS-CROWNED SPARROW	7
B489	CHIPPING SPARROW	
B493	BLACK-CHINNED SPARROW	
B494	VESPER SPARROW	
B495	LARK SPARROW	
B497	SAGE SPARROW	2, 7
B499	SAVANNAH SPARROW	3, 7
B501	GRASSHOPPER SPARROW	
B504	FOX SPARROW	
B505	SONG SPARROW	7
B506	LINCOLN'S SPARROW	
B510	WHITE-CROWNED SPARROW	
B509	GOLDEN-CROWNED SPARROW	
B512	DARK-EYED JUNCO	7
B475	BLACK-HEADED GROSBEAK	
B476	BLUE GROSBEAK	
B477	LAZULI BUNTING	
B809	INDIGO BUNTING	
B519	RED-WINGED BLACKBIRD	
B520	TRICOLORED BLACKBIRD	7
B521	WESTERN MEADOWLARK	
B522	YELLOW-HEADED BLACKBIRD	
B524	BREWER'S BLACKBIRD	
B528	BROWN-HEADED COWBIRD	
B530	HOODED ORIOLE	
B532	BULLOCK'S ORIOLE	
B534	GRAY-CROWNED ROSY-FINCH	
B535	PINE GROSBEAK	
B536	PURPLE FINCH	
B537	CASSIN'S FINCH	
B538	HOUSE FINCH	
B539	RED CROSSBILL	

B542	PINE SISKIN	
B543	LESSER GOLDFINCH	
B544	LAWRENCE'S GOLDFINCH	
B545	AMERICAN GOLDFINCH	
B546	EVENING GROSBEAK	
B547	HOUSE SPARROW	
M001	VIRGINIA OPOSSUM	14
M003	VAGRANT SHREW	7
M004	DUSKY SHREW	
M006	ORNATE SHREW	7, 10
M010	WATER SHREW	
M012	TROWBRIDGE'S SHREW	
M018	BROAD-FOOTED MOLE	7
M021	LITTLE BROWN MYOTIS	7
M023	YUMA MYOTIS	7
M025	LONG-EARED MYOTIS	
M026	FRINGED MYOTIS	
M027	LONG-LEGGED MYOTIS	
M028	CALIFORNIA MYOTIS	
M029	WESTERN SMALL-FOOTED MYOTIS	
M030	SILVER-HAIRED BAT	
M031	WESTERN PIPISTRELLE	
M032	BIG BROWN BAT	
M033	WESTERN RED BAT	12
M034	HOARY BAT	
M036	SPOTTED BAT	7
M037	TOWNSEND'S BIG-EARED BAT	7, 12
M038	PALLID BAT	7, 12
M039	BRAZILIAN FREE-TAILED BAT	
M042	WESTERN MASTIFF BAT	7
M043	AMERICAN PIKA	
M045	BRUSH RABBIT	3, 8, 14
M047	DESERT COTTONTAIL	14
M049	SNOWSHOE HARE	7, 14
M050	WHITE-TAILED JACKRABBIT	7, 14
M051	BLACK-TAILED JACKRABBIT	7, 14
M052	MOUNTAIN BEAVER	1, 7
M055	YELLOW-PINE CHIPMUNK	
M062	LONG-EARED CHIPMUNK	
M057	ALLEN'S CHIPMUNK	
M063	LODGEPOLE CHIPMUNK	12
M066	YELLOW-BELLIED MARMOT	
M070	BELDING'S GROUND SQUIRREL	
M072	CALIFORNIA GROUND SQUIRREL	
M075	GOLDEN-MANTLED GROUND SQUIRREL	
M077	WESTERN GRAY SQUIRREL	14
M079	DOUGLAS' SQUIRREL	14
M080	NORTHERN FLYING SQUIRREL	7, 12
M081	BOTTA'S POCKET GOPHER	

M085	MOUNTAIN POCKET GOPHER	
M087	SAN JOAQUIN POCKET MOUSE	7
M095	CALIFORNIA POCKET MOUSE	7
M104	HEERMANN'S KANGAROO RAT	1, 3, 5
M112	AMERICAN BEAVER	14
M113	WESTERN HARVEST MOUSE	
M117	DEER MOUSE	7
M119	BRUSH MOUSE	
M120	PINON MOUSE	
M127	DUSKY-FOOTED WOODRAT	7, 10
M128	BUSHY-TAILED WOODRAT	
M140	BLACK RAT	
M141	NORWAY RAT	
M142	HOUSE MOUSE	
M130	HEATHER VOLE	
M133	MONTANE VOLE	
M134	CALIFORNIA VOLE	1, 3, 7
M136	LONG-TAILED VOLE	
M139	COMMON MUSKRAT	14
M143	WESTERN JUMPING MOUSE	
M145	COMMON PORCUPINE	
M146	COYOTE	14
M147	RED FOX	4, 12, 14
M149	GRAY FOX	14
M151	BLACK BEAR	14
M152	RINGTAIL	5
M153	RACCOON	14
M154	AMERICAN MARTEN	7, 12
M155	FISHER	7, 12
M156	ERMINE	14
M157	LONG-TAILED WEASEL	14
M158	AMERICAN MINK	14
M159	WOLVERINE	4, 5, 12
M160	AMERICAN BADGER	14
M163	NORTHERN RIVER OTTER	7
M161	WESTERN SPOTTED SKUNK	7, 14
M162	STRIPED SKUNK	14
M165	MOUNTAIN LION	5, 7
M166	BOBCAT	14
M181	MULE DEER	14
M186	FERAL GOAT	14

Total Number of Species:351

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS SYSTEM – EL DORADO

California Wildlife Habitat Relationships System - 11/29/2001. Supported by California Interagency Wildlife Task Group and maintained by the California Department of Fish and Game. Database Version: 7.0. This copy of the Database is licensed to the USDA Natural Resources Conservation Service.

Species Summary Report

This list was compiled with the following Single Condition Query:

Location: El Dorado

Habitats: none (defaults to all)

Elements to Exclude: none

Available Species: all (default)

Status Selection: none (defaults to all)

Season Selection: none (defaults to all)

STATUS

1=Fed Endangered

5=Ca Fully Protected

8=Fed Prop Endangered

12=USFS Sensitive

2=Fed Threatened

6=Ca Protected

9=Fed Prop Threatened

13=CDF Sensitive

3=Ca Endangered

7=Ca Species of Special
Concern

10=Fed Candidate

14=Harvest

4=Ca Threatened

11=BLM Sensitive

ID	SPECIES NAME	STATUS
A003	LONG-TOED SALAMANDER	1, 3, 5, 6
A007	CALIFORNIA NEWT	7
A012	ENSATINA	7, 12
A022	ARBOREAL SALAMANDER	
A014	CALIFORNIA SLENDER SALAMANDER	
A023	MOUNT LYELL SALAMANDER	6, 7
A028	WESTERN SPADEFOOT	6, 7
A032	WESTERN TOAD	
A033	YOSEMITE TOAD	6, 7, 12
A039	PACIFIC CHORUS FROG	
A040	RED-LEGGED FROG	2, 6, 7, 12
A043	FOOTHILL YELLOW-LEGGED FROG	6, 7, 12
A044	MOUNTAIN YELLOW-LEGGED FROG	6, 7, 12
A045	NORTHERN LEOPARD FROG	7, 12
A046	BULLFROG	14
R004	WESTERN POND TURTLE	6, 7, 12
R022	WESTERN FENCE LIZARD	
R023	SAGEBRUSH LIZARD	
R029	COAST HORNED LIZARD	6, 7, 12
R036	WESTERN SKINK	7
R037	GILBERT'S SKINK	
R039	WESTERN WHIPTAIL	
R040	SOUTHERN ALLIGATOR LIZARD	
R042	NORTHERN ALLIGATOR LIZARD	

R046	RUBBER BOA	4, 6, 12
R048	RINGNECK SNAKE	12
R049	SHARP-TAILED SNAKE	
R051	RACER	
R053	STRIPED RACER	2, 4, 6
R057	GOPHER SNAKE	7
R058	COMMON KINGSNAKE	
R059	CALIFORNIA MOUNTAIN KINGSNAKE	6, 7, 12
R060	LONG-NOSED SNAKE	
R061	COMMON GARTER SNAKE	1, 3, 5, 6, 7
R062	WESTERN TERRESTRIAL GARTER SNAKE	
R063	WESTERN AQUATIC GARTER SNAKE	2, 4
R071	NIGHT SNAKE	
R076	WESTERN RATTLESNAKE	
B003	COMMON LOON	7
B006	PIED-BILLED GREBE	
B007	HORNED GREBE	
B009	EARED GREBE	
B010	WESTERN GREBE	
B548	CLARK'S GREBE	
B042	AMERICAN WHITE PELICAN	7
B044	DOUBLE-CRESTED CORMORANT	7
B049	AMERICAN BITTERN	
B051	GREAT BLUE HERON	13
B052	GREAT EGRET	13
B053	SNOWY EGRET	
B058	GREEN HERON	
B059	BLACK-CROWNED NIGHT HERON	
B108	TURKEY VULTURE	
B070	GREATER WHITE-FRONTED GOOSE	14
B075	CANADA GOOSE	2, 14
B067	TUNDRA SWAN	
B076	WOOD DUCK	14
B085	GADWALL	14
B087	AMERICAN WIGEON	14
B079	MALLARD	14
B082	BLUE-WINGED TEAL	14
B083	CINNAMON TEAL	14
B084	NORTHERN SHOVELER	14
B080	NORTHERN PINTAIL	14
B077	GREEN-WINGED TEAL	14
B089	CANVASBACK	14
B090	REDHEAD	14
B091	RING-NECKED DUCK	14
B093	GREATER SCAUP	14
B094	LESSER SCAUP	14
B096	HARLEQUIN DUCK	7, 14
B103	BUFFLEHEAD	14
B101	COMMON GOLDENEYE	14

B102	BARROW'S GOLDENEYE	7, 14
B104	HOODED MERGANSER	14
B105	COMMON MERGANSER	14
B106	RED-BREASTED MERGANSER	14
B107	RUDDY DUCK	14
B110	OSPREY	7, 13
B111	WHITE-TAILED KITE	5
B113	BALD EAGLE	2, 3, 5, 13
B114	NORTHERN HARRIER	7
B115	SHARP-SHINNED HAWK	7
B116	COOPER'S HAWK	7
B117	NORTHERN GOSHAWK	7, 12, 13
B119	RED-SHOULDERED HAWK	
B121	SWAINSON'S HAWK	4, 12
B123	RED-TAILED HAWK	
B124	FERRUGINOUS HAWK	7
B125	ROUGH-LEGGED HAWK	
B126	GOLDEN EAGLE	5, 7, 13
B127	AMERICAN KESTREL	
B128	MERLIN	7
B129	PEREGRINE FALCON	1, 3, 5, 13
B131	PRAIRIE FALCON	7
B133	RING-NECKED PHEASANT	14
B134	BLUE GROUSE	14
B138	WILD TURKEY	14
B141	MOUNTAIN QUAIL	14
B140	CALIFORNIA QUAIL	14
B145	VIRGINIA RAIL	
B146	SORA	
B148	COMMON MOORHEN	14
B149	AMERICAN COOT	14
B151	BLACK-BELLIED PLOVER	
B154	SNOWY PLOVER	2, 7
B156	SEMPALMATED PLOVER	
B158	KILLDEER	
B163	BLACK-NECKED STILT	
B164	AMERICAN AVOCET	
B165	GREATER YELLOWLEGS	
B166	LESSER YELLOWLEGS	
B168	WILLET	
B170	SPOTTED SANDPIPER	
B172	WHIMBREL	
B173	LONG-BILLED CURLEW	7
B176	MARbled GODWIT	
B177	RUDDY TURNSTONE	
B181	SANDERLING	
B183	WESTERN SANDPIPER	
B185	LEAST SANDPIPER	
B648	BAIRD'S SANDPIPER	7

B649	PECTORAL SANDPIPER	
B191	DUNLIN	
B196	SHORT-BILLED DOWITCHER	
B197	LONG-BILLED DOWITCHER	
B199	COMMON SNIPE	14
B200	WILSON'S PHALAROPE	
B655	RED-NECKED PHALAROPE	
B211	BONAPARTE'S GULL	
B214	RING-BILLED GULL	
B215	CALIFORNIA GULL	7
B216	HERRING GULL	
B227	CASPIAN TERN	
B231	COMMON TERN	
B233	FORSTER'S TERN	
B235	BLACK TERN	7
B250	ROCK DOVE	
B251	BAND-TAILED PIGEON	14
B255	MOURNING DOVE	14
B260	GREATER ROADRUNNER	
B262	BARN OWL	
B263	FLAMMULATED OWL	
B264	WESTERN SCREECH OWL	
B265	GREAT HORNED OWL	
B267	NORTHERN PYGMY OWL	
B269	BURROWING OWL	7
B270	SPOTTED OWL	2, 7, 11, 12, 13
B272	LONG-EARED OWL	7
B273	SHORT-EARED OWL	7
B274	NORTHERN SAW-WHET OWL	
B275	LESSER NIGHTHAWK	
B276	COMMON NIGHTHAWK	
B277	COMMON POORWILL	
B279	BLACK SWIFT	7
B281	VAUX'S SWIFT	7
B282	WHITE-THROATED SWIFT	
B286	BLACK-CHINNED HUMMINGBIRD	
B287	ANNA'S HUMMINGBIRD	
B289	CALLIOPE HUMMINGBIRD	
B291	RUFIOUS HUMMINGBIRD	
B293	BELTED KINGFISHER	
B294	LEWIS' WOODPECKER	
B296	ACORN WOODPECKER	
B300	WILLIAMSON'S SAPSUCKER	
B299	RED-BREASTED SAPSUCKER	
B302	NUTTALL'S WOODPECKER	
B303	DOWNY WOODPECKER	
B304	HAIRY WOODPECKER	
B305	WHITE-HEADED WOODPECKER	
B306	BLACK-BACKED WOODPECKER	

B307	NORTHERN FLICKER	3
B308	PILEATED WOODPECKER	
B309	OLIVE-SIDED FLYCATCHER	
B311	WESTERN WOOD-PEWEE	
B315	WILLOW FLYCATCHER	1, 3, 12
B317	HAMMOND'S FLYCATCHER	
B319	GRAY FLYCATCHER	
B318	DUSKY FLYCATCHER	
B320	PACIFIC-SLOPE FLYCATCHER	
B321	BLACK PHOEBE	
B323	SAY'S PHOEBE	
B326	ASH-THROATED FLYCATCHER	
B333	WESTERN KINGBIRD	
B410	LOGGERHEAD SHRIKE	1, 7
B409	NORTHERN SHRIKE	
B554	PLUMBEOUS VIREO	
B415	CASSIN'S VIREO	
B417	HUTTON'S VIREO	
B418	WARBLING VIREO	
B346	STELLER'S JAY	
B348	WESTERN SCRUB-JAY	7
B349	PINYON JAY	
B350	CLARK'S NUTCRACKER	
B351	BLACK-BILLED MAGPIE	
B352	YELLOW-BILLED MAGPIE	
B353	AMERICAN CROW	14
B354	COMMON RAVEN	
B337	HORNED LARK	7
B338	PURPLE MARTIN	7
B339	TREE SWALLOW	
B340	VIOLET-GREEN SWALLOW	
B341	NORTHERN ROUGH-WINGED SWALLOW	
B342	BANK SWALLOW	4
B343	CLIFF SWALLOW	
B344	BARN SWALLOW	
B356	MOUNTAIN CHICKADEE	
B357	CHESTNUT-BACKED CHICKADEE	
B358	OAK TITMOUSE	
B552	JUNIPER TITMOUSE	
B360	BUSHTIT	
B361	RED-BREASTED NUTHATCH	
B362	WHITE-BREASTED NUTHATCH	
B363	PYGMY NUTHATCH	
B364	BROWN CREEPER	
B366	ROCK WREN	
B367	CANYON WREN	
B368	BEWICK'S WREN	
B369	HOUSE WREN	
B370	WINTER WREN	

B372	MARSH WREN	
B373	AMERICAN DIPPER	
B375	GOLDEN-CROWNED KINGLET	
B376	RUBY-CROWNED KINGLET	
B377	BLUE-GRAY GNATCATCHER	
B380	WESTERN BLUEBIRD	
B381	MOUNTAIN BLUEBIRD	
B382	TOWNSEND'S SOLITAIRE	
B385	SWAINSON'S THRUSH	
B386	HERMIT THRUSH	
B389	AMERICAN ROBIN	
B390	VARIED THRUSH	
B391	WRENTIT	
B393	NORTHERN MOCKINGBIRD	
B398	CALIFORNIA THRASHER	2
B411	EUROPEAN STARLING	
B404	AMERICAN PIPIT	
B407	CEDAR WAXWING	
B408	PHAINOPEPLA	
B425	ORANGE-CROWNED WARBLER	
B426	NASHVILLE WARBLER	
B430	YELLOW WARBLER	7
B435	YELLOW-RUMPED WARBLER	
B436	BLACK-THROATED GRAY WARBLER	
B437	TOWNSEND'S WARBLER	
B438	HERMIT WARBLER	
B460	MACGILLIVRAY'S WARBLER	
B461	COMMON YELLOWTHROAT	7
B463	WILSON'S WARBLER	
B467	YELLOW-BREASTED CHAT	7
B471	WESTERN TANAGER	
B482	GREEN-TAILED TOWHEE	
B483	SPOTTED TOWHEE	7
B484	CALIFORNIA TOWHEE	2, 3
B487	RUFIOUS-CROWNED SPARROW	7
B489	CHIPPING SPARROW	
B491	BREWER'S SPARROW	
B493	BLACK-CHINNED SPARROW	
B494	VESPER SPARROW	
B495	LARK SPARROW	
B497	SAGE SPARROW	2, 7
B499	SAVANNAH SPARROW	3, 7
B501	GRASSHOPPER SPARROW	
B504	FOX SPARROW	
B505	SONG SPARROW	7
B506	LINCOLN'S SPARROW	
B510	WHITE-CROWNED SPARROW	
B509	GOLDEN-CROWNED SPARROW	
B512	DARK-EYED JUNCO	7

B475	BLACK-HEADED GROSBEAK	
B476	BLUE GROSBEAK	
B477	LAZULI BUNTING	
B809	INDIGO BUNTING	
B519	RED-WINGED BLACKBIRD	
B520	TRICOLORED BLACKBIRD	7
B521	WESTERN MEADOWLARK	
B522	YELLOW-HEADED BLACKBIRD	
B524	BREWER'S BLACKBIRD	
B528	BROWN-HEADED COWBIRD	
B532	BULLOCK'S ORIOLE	
B534	GRAY-CROWNED ROSY-FINCH	
B535	PINE GROSBEAK	
B536	PURPLE FINCH	
B537	CASSIN'S FINCH	
B538	HOUSE FINCH	
B539	RED CROSSBILL	
B542	PINE SISKIN	
B543	LESSER GOLDFINCH	
B544	LAWRENCE'S GOLDFINCH	
B545	AMERICAN GOLDFINCH	
B546	EVENING GROSBEAK	
B547	HOUSE SPARROW	
M001	VIRGINIA OPOSSUM	14
M003	VAGRANT SHREW	7
M004	DUSKY SHREW	
M006	ORNATE SHREW	7, 10
M010	WATER SHREW	
M012	TROWBRIDGE'S SHREW	
M018	BROAD-FOOTED MOLE	7
M021	LITTLE BROWN MYOTIS	7
M023	YUMA MYOTIS	7
M025	LONG-EARED MYOTIS	
M026	FRINGED MYOTIS	
M027	LONG-LEGGED MYOTIS	
M028	CALIFORNIA MYOTIS	
M029	WESTERN SMALL-FOOTED MYOTIS	
M030	SILVER-HAIRED BAT	
M031	WESTERN PIPISTRELLE	
M032	BIG BROWN BAT	
M033	WESTERN RED BAT	12
M034	HOARY BAT	
M036	SPOTTED BAT	7
M037	TOWNSEND'S BIG-EARED BAT	7, 12
M038	PALLID BAT	7, 12
M039	BRAZILIAN FREE-TAILED BAT	
M042	WESTERN MASTIFF BAT	7
M043	AMERICAN PIKA	
M045	BRUSH RABBIT	3, 8, 14

M046	MOUNTAIN COTTONTAIL	14
M047	DESERT COTTONTAIL	14
M049	SNOWSHOE HARE	7, 14
M050	WHITE-TAILED JACKRABBIT	7, 14
M051	BLACK-TAILED JACKRABBIT	7, 14
M052	MOUNTAIN BEAVER	1, 7
M055	YELLOW-PINE CHIPMUNK	
M062	LONG-EARED CHIPMUNK	
M057	ALLEN'S CHIPMUNK	
M063	LODGEPOLE CHIPMUNK	12
M066	YELLOW-BELLIED MARMOT	
M070	BELDING'S GROUND SQUIRREL	
M072	CALIFORNIA GROUND SQUIRREL	
M075	GOLDEN-MANTLED GROUND SQUIRREL	
M077	WESTERN GRAY SQUIRREL	14
M079	DOUGLAS' SQUIRREL	14
M080	NORTHERN FLYING SQUIRREL	7, 12
M081	BOTTA'S POCKET GOPHER	
M083	NORTHERN POCKET GOPHER	
M085	MOUNTAIN POCKET GOPHER	
M095	CALIFORNIA POCKET MOUSE	7
M105	CALIFORNIA KANGAROO RAT	7
M112	AMERICAN BEAVER	14
M113	WESTERN HARVEST MOUSE	
M117	DEER MOUSE	7
M118	CANYON MOUSE	
M119	BRUSH MOUSE	
M120	PINON MOUSE	
M127	DUSKY-FOOTED WOODRAT	7, 10
M128	BUSHY-TAILED WOODRAT	
M140	BLACK RAT	
M141	NORWAY RAT	
M142	HOUSE MOUSE	
M130	HEATHER VOLE	
M133	MONTANE VOLE	
M134	CALIFORNIA VOLE	1, 3, 7
M136	LONG-TAILED VOLE	
M139	COMMON MUSKRAT	14
M143	WESTERN JUMPING MOUSE	
M145	COMMON PORCUPINE	
M146	COYOTE	14
M147	RED FOX	4, 12, 14
M149	GRAY FOX	14
M151	BLACK BEAR	14
M152	RINGTAIL	5
M153	RACCOON	14
M154	AMERICAN MARTEN	7, 12
M155	FISHER	7, 12
M156	ERMINE	14

M157	LONG-TAILED WEASEL	14
M158	AMERICAN MINK	14
M159	WOLVERINE	4, 5, 12
M160	AMERICAN BADGER	14
M163	NORTHERN RIVER OTTER	7
M161	WESTERN SPOTTED SKUNK	7, 14
M162	STRIPED SKUNK	14
M165	MOUNTAIN LION	5, 7
M166	BOBCAT	14
M181	MULE DEER	14

Total Number of Species:377

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS SYSTEM – SACRAMENTO

California Wildlife Habitat Relationships System - 11/29/2001. Supported by California Interagency Wildlife Task Group and maintained by the California Department of Fish and Game. Database Version: 7.0. This copy of the Database is licensed to the USDA Natural Resources Conservation Service.

Species Summary Report

This list was compiled with the following Single Condition Query:

Location: Sacramento

Habitats: none (defaults to all)

Elements to Exclude: none

Available Species: all (default)

Status Selection: none (defaults to all)

Season Selection: none (defaults to all)

STATUS

1=Fed Endangered

2=Fed Threatened

3=Ca Endangered

4=Ca Threatened

5=Ca Fully Protected

6=Ca Protected

7=Ca Species of Special
Concern

8=Fed Prop Endangered

9=Fed Prop Threatened

10=Fed Candidate

11=BLM Sensitive

12=USFS Sensitive

13=CDF Sensitive

14=Harvest

ID	SPECIES NAME	STATUS
A047	TIGER SALAMANDER	
A001	CALIFORNIA TIGER SALAMANDER	6, 7, 10
A012	ENSATINA	7, 12
A022	ARBOREAL SALAMANDER	
A014	CALIFORNIA SLENDER SALAMANDER	
A028	WESTERN SPADEFOOT	6, 7

A032	WESTERN TOAD	
A039	PACIFIC CHORUS FROG	
A040	RED-LEGGED FROG	2, 6, 7, 12
A043	FOOTHILL YELLOW-LEGGED FROG	6, 7, 12
A046	BULLFROG	14
R004	WESTERN POND TURTLE	6, 7, 12
R003	SLIDER	
R022	WESTERN FENCE LIZARD	
R029	COAST HORNED LIZARD	6, 7, 12
R036	WESTERN SKINK	7
R037	GILBERT'S SKINK	
R039	WESTERN WHIPTAIL	
R040	SOUTHERN ALLIGATOR LIZARD	
R048	RINGNECK SNAKE	12
R049	SHARP-TAILED SNAKE	
R051	RACER	
R053	STRIPED RACER	2, 4, 6
R057	GOPHER SNAKE	7
R058	COMMON KINGSNAKE	
R059	CALIFORNIA MOUNTAIN KINGSNAKE	6, 7, 12
R061	COMMON GARTER SNAKE	1, 3, 5, 6, 7
R062	WESTERN TERRESTRIAL GARTER SNAKE	
R079	GIANT GARTER SNAKE	2, 4, 6
R071	NIGHT SNAKE	
R076	WESTERN RATTLESNAKE	
B003	COMMON LOON	7
B006	PIED-BILLED GREBE	
B007	HORNED GREBE	
B009	EARED GREBE	
B010	WESTERN GREBE	
B548	CLARK'S GREBE	
B042	AMERICAN WHITE PELICAN	7
B044	DOUBLE-CRESTED CORMORANT	7
B049	AMERICAN BITTERN	
B050	LEAST BITTERN	7
B051	GREAT BLUE HERON	13
B052	GREAT EGRET	13
B053	SNOWY EGRET	
B057	CATTLE EGRET	
B058	GREEN HERON	
B059	BLACK-CROWNED NIGHT HERON	
B062	WHITE-FACED IBIS	7
B603	WOOD STORK	1, 7
B108	TURKEY VULTURE	
B070	GREATER WHITE-FRONTED GOOSE	14
B071	SNOW GOOSE	14
B072	ROSS' GOOSE	14
B075	CANADA GOOSE	2, 14
B067	TUNDRA SWAN	

B076	WOOD DUCK	14
B085	GADWALL	14
B086	EURASIAN WIGEON	14
B087	AMERICAN WIGEON	14
B079	MALLARD	14
B082	BLUE-WINGED TEAL	14
B083	CINNAMON TEAL	14
B084	NORTHERN SHOVELER	14
B080	NORTHERN PINTAIL	14
B077	GREEN-WINGED TEAL	14
B089	CANVASBACK	14
B090	REDHEAD	14
B091	RING-NECKED DUCK	14
B093	GREATER SCAUP	14
B094	LESSER SCAUP	14
B103	BUFFLEHEAD	14
B101	COMMON GOLDENEYE	14
B102	BARROW'S GOLDENEYE	7, 14
B104	HOODED MERGANSER	14
B105	COMMON MERGANSER	14
B107	RUDDY DUCK	14
B110	OSPREY	7, 13
B111	WHITE-TAILED KITE	5
B113	BALD EAGLE	2, 3, 5, 13
B114	NORTHERN HARRIER	7
B115	SHARP-SHINNED HAWK	7
B116	COOPER'S HAWK	7
B119	RED-SHOULDERED HAWK	
B121	SWAINSON'S HAWK	4, 12
B123	RED-TAILED HAWK	
B124	FERRUGINOUS HAWK	7
B125	ROUGH-LEGGED HAWK	
B126	GOLDEN EAGLE	5, 7, 13
B127	AMERICAN KESTREL	
B128	MERLIN	7
B129	PEREGRINE FALCON	1, 3, 5, 13
B131	PRAIRIE FALCON	7
B133	RING-NECKED PHEASANT	14
B138	WILD TURKEY	14
B140	CALIFORNIA QUAIL	14
B143	BLACK RAIL	4, 5
B145	VIRGINIA RAIL	
B146	SORA	
B148	COMMON MOORHEN	14
B149	AMERICAN COOT	14
B150	SANDHILL CRANE	4, 5, 12
B151	BLACK-BELLIED PLOVER	
B629	PACIFIC GOLDEN-PLOVER	
B156	SEMPALMATED PLOVER	

B158	KILLDEER	
B163	BLACK-NECKED STILT	
B164	AMERICAN AVOCET	
B165	GREATER YELLOWLEGS	
B166	LESSER YELLOWLEGS	
B170	SPOTTED SANDPIPER	
B172	WHIMBREL	
B173	LONG-BILLED CURLEW	7
B183	WESTERN SANDPIPER	
B185	LEAST SANDPIPER	
B648	BAIRD'S SANDPIPER	7
B649	PECTORAL SANDPIPER	
B191	DUNLIN	
B197	LONG-BILLED DOWITCHER	
B199	COMMON SNIPE	14
B200	WILSON'S PHALAROPE	
B655	RED-NECKED PHALAROPE	
B211	BONAPARTE'S GULL	
B213	MEW GULL	
B214	RING-BILLED GULL	
B215	CALIFORNIA GULL	7
B216	HERRING GULL	
B217	THAYER'S GULL	
B221	GLAUCOUS-WINGED GULL	
B227	CASPIAN TERN	
B233	FORSTER'S TERN	
B235	BLACK TERN	7
B250	ROCK DOVE	
B251	BAND-TAILED PIGEON	14
B255	MOURNING DOVE	14
B260	GREATER ROADRUNNER	
B262	BARN OWL	
B264	WESTERN SCREECH OWL	
B265	GREAT HORNED OWL	
B267	NORTHERN PYGMY OWL	
B269	BURROWING OWL	7
B272	LONG-EARED OWL	7
B273	SHORT-EARED OWL	7
B274	NORTHERN SAW-WHET OWL	
B275	LESSER NIGHTHAWK	
B277	COMMON POORWILL	
B281	VAUX'S SWIFT	7
B282	WHITE-THROATED SWIFT	
B286	BLACK-CHINNED HUMMINGBIRD	
B287	ANNA'S HUMMINGBIRD	
B289	CALLIOPE HUMMINGBIRD	
B291	RUFIOUS HUMMINGBIRD	
B292	ALLEN'S HUMMINGBIRD	
B293	BELTED KINGFISHER	

B294	LEWIS' WOODPECKER	
B296	ACORN WOODPECKER	
B299	RED-BREASTED SAPSUCKER	
B302	NUTTALL'S WOODPECKER	
B303	DOWNY WOODPECKER	
B307	NORTHERN FLICKER	3
B309	OLIVE-SIDED FLYCATCHER	
B311	WESTERN WOOD-PEWEE	
B315	WILLOW FLYCATCHER	1, 3, 12
B317	HAMMOND'S FLYCATCHER	
B319	GRAY FLYCATCHER	
B318	DUSKY FLYCATCHER	
B320	PACIFIC-SLOPE FLYCATCHER	
B321	BLACK PHOEBE	
B323	SAY'S PHOEBE	
B326	ASH-THROATED FLYCATCHER	
B333	WESTERN KINGBIRD	
B410	LOGGERHEAD SHRIKE	1, 7
B554	PLUMBEOUS VIREO	
B417	HUTTON'S VIREO	
B418	WARBLING VIREO	
B348	WESTERN SCRUB-JAY	7
B352	YELLOW-BILLED MAGPIE	
B353	AMERICAN CROW	14
B337	HORNED LARK	7
B338	PURPLE MARTIN	7
B339	TREE SWALLOW	
B340	VIOLET-GREEN SWALLOW	
B341	NORTHERN ROUGH-WINGED SWALLOW	
B342	BANK SWALLOW	4
B343	CLIFF SWALLOW	
B344	BARN SWALLOW	
B358	OAK TITMOUSE	
B360	BUSHTIT	
B361	RED-BREASTED NUTHATCH	
B362	WHITE-BREASTED NUTHATCH	
B364	BROWN CREEPER	
B366	ROCK WREN	
B368	BEWICK'S WREN	
B369	HOUSE WREN	
B370	WINTER WREN	
B372	MARSH WREN	
B375	GOLDEN-CROWNED KINGLET	
B376	RUBY-CROWNED KINGLET	
B377	BLUE-GRAY GNATCATCHER	
B380	WESTERN BLUEBIRD	
B381	MOUNTAIN BLUEBIRD	
B385	SWAINSON'S THRUSH	
B386	HERMIT THRUSH	

B389	AMERICAN ROBIN	
B390	VARIED THRUSH	
B391	WRENTIT	
B393	NORTHERN MOCKINGBIRD	
B398	CALIFORNIA THRASHER	2
B411	EUROPEAN STARLING	
B404	AMERICAN PIPIT	
B407	CEDAR WAXWING	
B408	PHAINOPEPLA	
B425	ORANGE-CROWNED WARBLER	
B426	NASHVILLE WARBLER	
B430	YELLOW WARBLER	7
B435	YELLOW-RUMPED WARBLER	
B436	BLACK-THROATED GRAY WARBLER	
B437	TOWNSEND'S WARBLER	
B438	HERMIT WARBLER	
B773	AMERICAN REDSTART	
B460	MACGILLIVRAY'S WARBLER	
B461	COMMON YELLOWTHROAT	7
B463	WILSON'S WARBLER	
B467	YELLOW-BREASTED CHAT	7
B471	WESTERN TANAGER	
B483	SPOTTED TOWHEE	7
B484	CALIFORNIA TOWHEE	2, 3
B487	RUFIOUS-CROWNED SPARROW	7
B489	CHIPPING SPARROW	
B494	VESPER SPARROW	
B495	LARK SPARROW	
B499	SAVANNAH SPARROW	3, 7
B501	GRASSHOPPER SPARROW	
B504	FOX SPARROW	
B505	SONG SPARROW	7
B506	LINCOLN'S SPARROW	
B798	WHITE-THROATED SPARROW	
B799	HARRIS'S SPARROW	
B510	WHITE-CROWNED SPARROW	
B509	GOLDEN-CROWNED SPARROW	
B512	DARK-EYED JUNCO	7
B475	BLACK-HEADED GROSBEAK	
B476	BLUE GROSBEAK	
B477	LAZULI BUNTING	
B809	INDIGO BUNTING	
B519	RED-WINGED BLACKBIRD	
B520	TRICOLORED BLACKBIRD	7
B521	WESTERN MEADOWLARK	
B522	YELLOW-HEADED BLACKBIRD	
B524	BREWER'S BLACKBIRD	
B528	BROWN-HEADED COWBIRD	
B530	HOODED ORIOLE	

B532	BULLOCK'S ORIOLE	
B536	PURPLE FINCH	
B538	HOUSE FINCH	
B542	PINE SISKIN	
B543	LESSER GOLDFINCH	
B544	LAWRENCE'S GOLDFINCH	
B545	AMERICAN GOLDFINCH	
B547	HOUSE SPARROW	
M001	VIRGINIA OPOSSUM	14
M006	ORNATE SHREW	7, 10
M018	BROAD-FOOTED MOLE	7
M023	YUMA MYOTIS	7
M028	CALIFORNIA MYOTIS	
M031	WESTERN PIPISTRELLE	
M032	BIG BROWN BAT	
M033	WESTERN RED BAT	12
M034	HOARY BAT	
M037	TOWNSEND'S BIG-EARED BAT	7, 12
M038	PALLID BAT	7, 12
M039	BRAZILIAN FREE-TAILED BAT	
M042	WESTERN MASTIFF BAT	7
M045	BRUSH RABBIT	3, 8, 14
M047	DESERT COTTONTAIL	14
M051	BLACK-TAILED JACKRABBIT	7, 14
M072	CALIFORNIA GROUND SQUIRREL	
M076	EASTERN GRAY SQUIRREL	14
M077	WESTERN GRAY SQUIRREL	14
M078	EASTERN FOX SQUIRREL	14
M081	BOTTA'S POCKET GOPHER	
M087	SAN JOAQUIN POCKET MOUSE	7
M105	CALIFORNIA KANGAROO RAT	7
M112	AMERICAN BEAVER	14
M113	WESTERN HARVEST MOUSE	
M114	SALT-MARSH HARVEST MOUSE	1, 3, 5
M117	DEER MOUSE	7
M119	BRUSH MOUSE	
M120	PINON MOUSE	
M127	DUSKY-FOOTED WOODRAT	7, 10
M140	BLACK RAT	
M141	NORWAY RAT	
M142	HOUSE MOUSE	
M134	CALIFORNIA VOLE	1, 3, 7
M139	COMMON MUSKRAT	14
M145	COMMON PORCUPINE	
M146	COYOTE	14
M147	RED FOX	4, 12, 14
M149	GRAY FOX	14
M152	RINGTAIL	5
M153	RACCOON	14

M157	LONG-TAILED WEASEL	14
M158	AMERICAN MINK	14
M160	AMERICAN BADGER	14
M163	NORTHERN RIVER OTTER	7
M161	WESTERN SPOTTED SKUNK	7, 14
M162	STRIPED SKUNK	14
M165	MOUNTAIN LION	5, 7
M166	BOBCAT	14
M181	MULE DEER	14
Total Number of Species:309		

APPENDIX C - REQUEST FOR ASSISTANCE

